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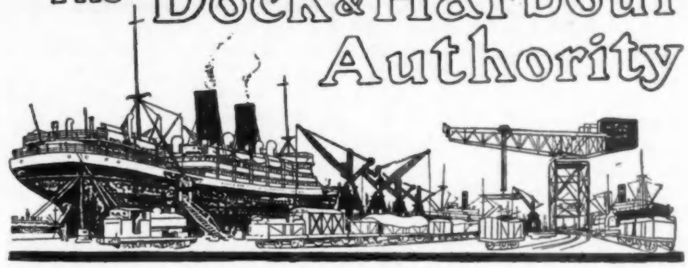
The Dock & Harbour Authority



No. 327. Vol. XXVIII. JANUARY, 1948

CONTENTS

Editorial Comments

The New Year.

At the commencement of another year, we would take this opportunity of sending greetings to all our readers throughout the world. May the coming twelve months witness a steady improvement in world trade, and may many of the shortages be made good and prosperity return. It is to be hoped that the uncertainties and anxieties which still persist in the international field will speedily be removed and that 1948 will see a lessening of the tension between nations which at present is frustrating all efforts being made for the establishment of a lasting peace.

It is probable that in years to come, 1948 will prove to have been the turning-point in the rehabilitation of Europe, at least as far as those countries which are accepting assistance under the Marshall Plan are concerned. This generous and practical arrangement will undoubtedly have a far-reaching effect on the economy of Europe with consequent benefit to the ports and shipping industries.

The New Regime.

The year 1948 will also be an important landmark in the history of the United Kingdom by reason of the coming into operation of the Transport Act, 1947, and the formal inauguration of a centralised Transport Commission which is bound to bring about drastic changes in the traffic arrangements of the country.

How far these changes will affect dock and harbour affairs is as yet, by no means certain, but the holding (as reported elsewhere in this issue) of a Press Conference in December, at which the announcement was made by Sir Cyril Hurcombe, the Chairman of the Transport Commission, that agreement had been reached on the terms of a scheme of delegation by the Commission transferring their rights, powers and liabilities under the Act to the Docks and Inland Waterways Executive, foreshadows the formulation by the latter body of definite arrangements for the working of the ports and maritime undertakings of the country under centralised management.

Until these arrangements are actually published it would be premature to attempt to anticipate their scope and purport. We can only express the hope that no step will be taken which will injure or impede in any way the overseas commerce of the country which, it will generally be admitted, has hitherto been handled at British ports, in an exceedingly efficient manner.

The Port of Southampton.

A number of articles describing the development of the Port of Southampton have already appeared in past issues of this Journal, but in view of the outstanding position Southampton holds among the ports of this country, and indeed of the whole world, it is only to be expected that it would be in the forefront as a subject of interest to all those connected with dock and harbour affairs.

As has been stated on previous occasions, Southampton has been favoured with great natural advantages which have given it a unique position among the ports of Great Britain. These endowments of nature have been put to maximum use by an enterprising administration, so that to-day, the port occupies a dual capacity as a leading commercial and the premier passenger port in the United Kingdom.

An interesting Paper giving an account of the origin and development of the Port of Southampton and of its relations with shipping, ship-building and ship-repairing, was read at the series of meetings held by the Institution of Naval Architects in September last, and we are indebted to the Institution and to Mr. O. H. Lewis, General Manager and Clerk, Southampton Harbour Board, the author of the Paper, for permission to reproduce on another page those sections which come within the purview of this Journal.

Dock and Quayside Lighting

That the efficient lighting of docks, quays, warehouses, cargo-handling appliances and all the multifarious equipment connected therewith is a matter of vital concern to all port authorities will be readily agreed. It is therefore surprising that a subject of so much importance has received such negligible attention in the past, that very little appears to have been written about the problems associated with it. However, during the past few years, and more especially during the recent war, when notable strides in the scientific world were made in all directions, a great advance was also made in the application of science to the lighting industry, so that to-day there is available to the lighting engineer many modern devices to assist him in his work.

It is obvious that no port authority can have at its disposal sufficient scientific technical staff to deal with all the diverse lighting problems which they encounter in the course of their duties, and in any case prudence demands that the assistance of experts in the lighting industry should be enlisted when major technical problems have to be solved. In this connection we would call attention to the admirable work of The Illuminating Engineering Society which has been engaged for a number of years in promoting the "science and art of lighting" by means of investigations which have proved undoubtedly beneficial to the industry generally. The Society has proceeded along lines established by its forerunner in the United States in 1906, which were followed by similar bodies

Editorial Comments—continued

in Germany in 1913 and in Austria-Hungary in 1915, culminating in the holding of an International Illuminating Congress in the United States in 1925.

Although it would be generally agreed that the assistance of specialists should be obtained when contemplating the installation of lighting systems of major importance, it has been suggested to us that there is a need among dock and harbour officials for general guidance in lighting problems peculiar to the industry, and accordingly, we have invited Mr. C. H. Nicholson, Docks Machinery Engineer of the London and North Eastern Railway, Hull, to give our readers the benefit of his wide experience by contributing a series of articles on the subject. The first of these will be found elsewhere in this issue.

Capital Expenditure and Port Development Projects.

Details of the reductions in capital expenditure proposed by the Government for the ensuing year, were published in a White Paper early in December. The fears that had been freely expressed in many quarters during the past few months have proved well founded, and retrenchment in expenditure on port development works is included among the cuts to be made.

As regards ports and harbours, the White Paper points out that the programme for 1948 included eleven projects of over £100,000. Some are essential in order to ease the handling of goods or hasten turn-round of ships; examples are transit sheds at Bristol (£111,000); Glasgow (£430,000) and Liverpool (£1,100,000). Other projects which are less likely to produce early returns are to be postponed. Examples are deep-water quays at Leith (£600,000) and reclamation and deepening work at Hendon, River Wear (£312,000).

It is unfortunate that such a drastic step has become necessary, and the Government's decision to postpone important development schemes will prove a serious handicap to many ports which have prepared plans for badly-needed improvements to be carried out. More especially will the curtailment of plans affect those ports which suffered damage from enemy action during the recent war, as they will continue to find themselves at a disadvantage owing to many of their quays being in urgent need of repair. Also much of their cargo-handling equipment has been destroyed or damaged to such an extent that their present rate of cargo-handling is much below the standard desirable and in a number of cases compares unfavourably with pre-war capacity.

Relaxation of plans for the recovery of pre-war efficiency at British ports is surely misplaced economy since the ports are the means by which foreign markets are reached and the national export trade is of vital importance to the country's economic recovery. It is essential that there should be no obstruction to the free flow abroad of British manufactures. Any retardation or delay in the execution of orders is bound to prejudice the position from a commercial point of view.

Firth of Forth Pilotage Authority.

It will be recalled that in our issue for March, 1947, we printed the salient points from a Report on Pilotage in the Firth and River of Forth, which was submitted to the Minister of Transport in October, 1946. The chief recommendation contained in the Report was that a single pilotage authority should be created to supersede the six different authorities which have functioned hitherto.

Following the presentation of the Report, a Re-Organisation Committee was set up under the chairmanship of Mr. T. A. S. Fortune, the General Manager and Secretary to the Leith Dock Commission. This Committee, after frequent meetings, submitted to the Minister of Transport some weeks ago, a Draft Order creating the single pilotage authority as advocated, in place of the six authorities constituted in the Pilotage Orders Confirmation (No. 4) Act, 1922.

The Order came into force on 1st November last and provides for eleven members. The new Authority will be accommodated in the offices of the Leith Dock Commissioners and Mr. Proudfoot, who is the Treasurer and Assistant General Manager, and Mr. Balfour Kinniar, the Law Agent and Assistant Secretary to the Commissioners for the Harbour and Docks of Leith, will act for the Pilotage Authority on a part-time basis.

Compulsory or Non-Compulsory Pilotage.

In the same issue (March, 1947), we referred to the controversial question of compulsory or non-compulsory pilotage, and expressed the view that, as a general rule, where the physical character of the estuary and approaches to a port do not present any great difficulty there is no justification for compulsory pilotage. This seems to be the generally accepted opinion and it is not surprising that at a meeting of the Chamber of Shipping of the United Kingdom held early last month, strong exception was taken by the Chamber, in consultation with the local shipowners' associations for the North East coast ports, to a proposal of the Sunderland Pilotage Authority to make pilotage compulsory in the Sunderland district. The Council passed unanimously a resolution re-affirming its previously considered view that the only ground for the adoption of compulsory pilotage was its justification as a measure of safety; and, having received advice from its pilotage committee that no evidence is available to support on safety grounds the proposal to apply compulsory pilotage in the Sunderland district, the Chamber expressed the opinion that such a radical change at Sunderland would not be in the best interests of the shipping and trade of the port; and endorsed the objection which has been lodged to the proposal.

A Chinese Harbour Project.

The Chinese Government has announced that a two-year programme is about to be put in hand to convert the Pearl River harbour of Whampoa, situated about 10 miles south of Canton, into a modern port capable of accommodating large ocean-going vessels. The Harbour Engineering Authority, which was recently established in Canton by the Ministry of Communications for this special undertaking has been promised every assistance by the Kwangtung Provincial Government and successful preliminary surveys have already been conducted by both the Central Government and the provincial authorities. It has also been arranged that American engineers will give technical assistance.

The programme will be carried out in two stages, the principal attention at the beginning being given to the construction of the Whampoa Harbour, including dredging and the building of wharves and docks, and in the second stage to covering all the essential problems connected with the construction of a modern city

Hitherto, Canton has been unable to compete with Hongkong for commercial supremacy, as it is located at the inner tip of an estuary, which is too shallow to accommodate deep-sea vessels. It is not intended that the new port of Whampoa shall replace Canton, but that the two ports will be complementary to each other. Another point of interest is the fact that the original scheme of making Whampoa into one of the biggest harbours in South China was initiated by Dr. Sun Yat-sen, the Founder of the Republic, in his book "Outline of National Reconstruction."

Radar for the Humber Ferry Service.

Since the end of the recent war the London and North Eastern Railway has been keeping in close touch with radar development with a view to seeing if suitable equipment could be devised for use on the Humber ferry steamers. In considering the local problem on the River Humber, with its peculiar channels, sand banks, tides and currents, it had to be borne in mind that the difficulty in dense fog was not so much in navigating from pier to pier on the two sides of the river, but rather the avoidance of impact with other objects, such as light ships and buoys, commercial and fishing vessels and other craft, which are frequently riding at anchor off the Hull Docks. Also in view of the fact that the ferry steamers carry over a million passengers a year across the river in practically all weathers, including fog and bad visibility, the masters of the ferry boats have a serious responsibility in deciding whether the conditions make it possible to cross in safety with so many lives at stake.

It is therefore of interest to note that early this year one of the ferry steamers is to be fitted experimentally with radar. The equipment, which will be supplied by Marine Instruments, Ltd., will be the latest type, suitable for close range working under river conditions, and extended trials will be arranged to see whether Humber fog difficulties can be satisfactorily overcome.

The Port of Southampton

The Origin and Development of the Port and its Relations with Shipping, Shipbuilding and Ship-repairing*

By O. H. LEWIS, M.Inst.T., General Manager and Clerk, Southampton Harbour Board.

AMONG British seaports Southampton occupies a remarkable position and enjoys the proud distinction of being the premier passenger port and therefore Britain's gateway.

Nature has been generous to Southampton, and the fifteen miles of naturally wide and deep approach to the quays and docks of the port along the Solent and Southampton Water are all land-locked and sheltered from every quarter. Where necessary, nature has been, and is being, assisted by dredging, and the present unsurpassed facilities of the port are a reflection of the wisdom and enterprise of the dock owners and port administrators, especially during the past fifty years. An American general, when recently visiting Southampton, referred to the port of Southampton as being "God-made and man-developed."

Natural Development and Endowments

A great natural advantage possessed by the port is the double high tide, that is, a set of two high-water crests separated from each other by about two hours. This phenomenon occurs twice during a twenty-four hour day. Then there is the "young flood" stand, which is an interruption of the normal tidal rise, causing a "slack-water" period which occurs from one-and-a-half to three hours after low water, and during which the tidal level is maintained at levels from 5-ft. to 6-ft. above local low-water datum level. Thus during the twenty-four hours of each day there are periods of "slack water" at a level navigable by all types of ships, totalling seven hours in duration.

Various theories have been advanced as to the reason for this tidal phenomenon, and most of the features can be reproduced by the method of harmonic analysis. It should be pointed out, however, that the Isle of Wight has very little part in these features, which extend, with small modifications, to the adjacent coasts of France.

Since the time of the Venerable Bede (eighth century) it has been held by many that one wave comes up the English Channel, causing the first high water, whereas the other, originating about twelve hours earlier, has come round the Scottish coasts, down the North Sea and through the Straits of Dover, causing the second high water. The hydrographers of the Southampton Harbour Board have always maintained the substantial truth of this theory, although like all others advanced it does not completely account for many of the smaller features of these phenomena, the causes of which remain in some obscurity.

The result of these geographical and tidal features is a port giving unprecedented natural depths for the British Isles with phenomenally favourable tidal levels for the world's largest liners (without locking systems), full protection against gales from all directions and against the heavy swells coming in from the West Atlantic.

Early History

The history of the port of Southampton stretches far back into centuries B.C., and from the time when the Romans, in the reign of the Emperor Claudius A.D. 50, founded the fortified station of Clausentum on the banks of the river Itchen, to protect the primitive port and the river approach to the capital city of Winchester, the history of Southampton has been in the main the history of England.

All the world knows that the port of Southampton can accommodate the world's largest ships. All the world ought to know it, for the fact is a very old one; it was common knowledge in the reign of Ethelwolf, over a thousand years ago. Southampton was even then an old and thriving town, good proof of its prosperity being that the Danes thought it worthy of robbery. The inhabitants of the town eventually welcomed the Danes and gave their support to Canute, and it was at Southampton that he attempted to control the tide.

In the early days of the Christian era there are records of steady development in maritime trade, and by the time of Edward the Confessor (1042) the town and port had reached a state of considerable importance and wealth.

The coming of the Normans contributed a new factor to the prosperity of Southampton. Its convenience as a port of arrival from Normandy made it the chosen port of entry for French trade, and the harbour at that time is stated to have assumed the thriving appearance of a world-port.

In the year 1150 the wine trade commenced, and this played an exceedingly important part in the prosperity of the town and the history of the port. The customs of the port were assigned to the burgesses by King John (1199-1216) for an annual payment of £200.

The prosperity of the town and port was enhanced by the extension of the Venetian trade and by commerce with the East from 1325 onwards, so that Southampton became the centre of all trade with Spain and the Mediterranean countries. This prosperity was interrupted in 1338 by the rupture with France over Edward III's claim to its throne. The mayor was commanded by writ to cause "All ships of 40 tons burthen and up to be provisioned with men and stores to repel any attempt at invasion," but before the preparations could be completed the French, together with Genoese and Spanish allies, entered the town and, after plundering it, destroyed the greater part by fire. A period of depression followed, as many merchants were completely ruined and others sought places less prone to attack.

In 1346 the Black Prince assembled his army at Southampton, and in 1415 the army of Henry V was also assembled here, and the bulk of the troops who fought at Crecy and at Agincourt marched through the West Gate, which is still standing, to embark at the old West Quay. Wars with France greatly affected commerce, and contention between the rival houses of York and Lancaster provided a further hindrance to trade; yet in 1450, despite these setbacks, Southampton ranked as the third port in the kingdom, London being the first and Bristol second.

In 1451, Henry VI granted Admiralty jurisdiction to the borough, when the Mayor of Southampton, as Admiral of the Port, had an oar carried before him. A silver oar still exists among the town regalia and the Mayor is still the Admiral of the Port. At that time the port extended from Langstone in the east to Hurst in the west.

Following the prohibition by Henry VIII of the export of wool, upon which trade much of Southampton's prosperity had been established, commercial activity declined for nearly a century, but the port retained its importance, as is instanced by the reception of the Spanish and English fleets which escorted Philip of Spain when he landed at the Town Quay in 1554 before proceeding to Winchester for his marriage to Queen Mary.

At the West Quay, on August 15th, 1620, world history was made when the "Pilgrim Fathers" embarked in their small 180-ton ship, the *Mayflower*, and left the port of Southampton on the hazardous voyage across the Atlantic to the great but unknown destiny which awaited them—the founding of the New England States and all that it meant in the annals of America. It is worthy

*Abstract of a Paper read at the Autumn Meeting of the Institution of Naval Architects in Southampton, on September 25th, 1947, and reproduced by permission.

Port of Southampton—continued

of record that the *Mayflower* sailed from Southampton and only called at Plymouth.

Throughout the eighteenth century the port had to fight very hard for its position, and in the absence of the regular shipping trade, which was being diverted to other centres, more attention seems to have been paid to converting Southampton into a fashionable watering-place.

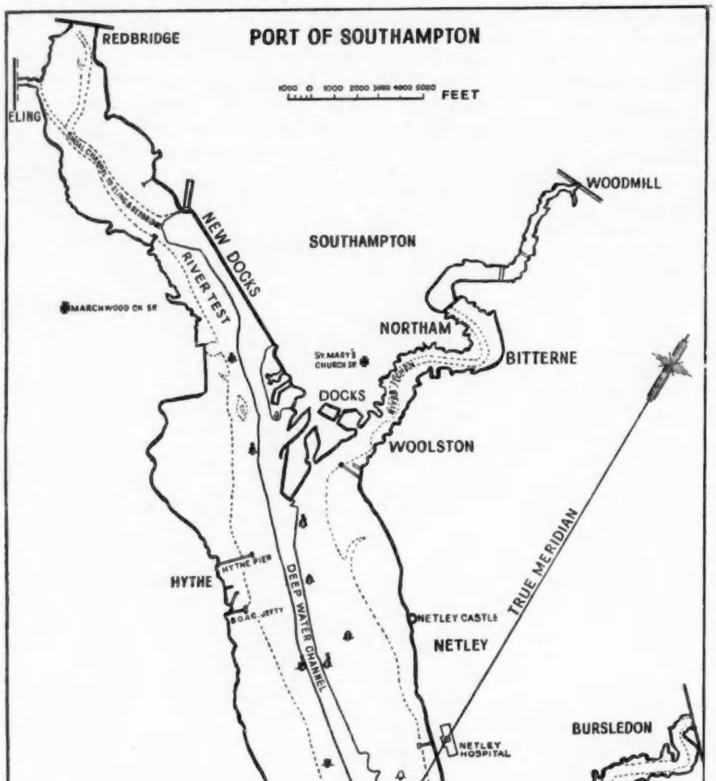


Fig. 1.

The Modern Port

The beginning of the nineteenth century, however, was a period of great trade expansion throughout the country, and in 1803 the burgesses of Southampton awoke to the realisation that the port was capable of being rendered more commodious for carrying on trade, both foreign and coastwise. Accordingly, an Act of Parliament was passed setting up a body of Commissioners, comprising the Mayor and Corporation, Recorder and ten Special Commissioners, to administer the affairs of the port and to have jurisdiction over the waters of the port extending from just outside Calshot up Southampton Water and including portions of the rivers Hamble, Test and Itchen.

These Commissioners were empowered to improve the existing quays and wharves and to construct a basin or wet dock and pier. They bought up old premises which abutted on the waterside of the old town walls, carried out certain improvements to the quays, and eventually embarked upon the first major extension of port facilities by constructing a pier to accommodate the steam packets which were running services to the Isle of Wight and the Channel Islands. The pier was opened by the Princess Victoria (afterwards Queen Victoria), assisted by her mother (The Duchess of Kent), on July 8th, 1833, in the presence of the Mayor and Corporation, the Harbour Commissioners, and a large assembly of the inhabitants of the town. This event marked the commencement of a new and important era in the history of the port.

The opening of the Royal Pier greatly facilitated the French and Channel Island services, but the construction of the London and Southampton Railway emphasised the need for more adequate quayside terminals, and while the activities of the new Commissioners were concentrated on the Royal Pier, another group (some of whom were members of the Harbour Commission) formed a committee to promote a bill in parliament to revive the powers for the construction of docks. This bill was passed, and in 1836 a company was formed with a capital of £500,000 with powers similar to those granted to the Harbour Commissioners. Two years later the foundation stone of the first dock was laid, and thus was born the immense docks system at Southampton.

The first ships to enter the completed new dock, known as the Outer Dock, in 1843, were the *Liverpool* and *Tagus* of the P. & O. Line, which line had by this time followed the earlier example of the Royal Mail Steam Packet Company in making Southampton the principal base for its services. The trade of the port increased considerably, and other docks, dry docks and quays were constructed and put into use, and when the heavily subsidised American mail services started in 1847 Southampton was chosen as a port of call for the Havre and Bremen lines, their wooden paddlers being the biggest ships to visit the port. In reporting to his government in 1854, the Amedican Consul at Southampton stated that Southampton was the most flourishing port in the south of England in consequence of its being the principal station of the largest ocean steam-ships in the world, and that the port eclipsed London in the size of the steam vessels using its waters, and vied with Liverpool in the extent of its passenger traffic, while it excelled both of those ports in its easiness of access and facilities for the handling of passengers and cargo at all times of the tide and in all seasons.

Further improvements in the port proceeded steadily, and in 1857 the Union Line to the Cape made Southampton its base. In the same year the Norddeutscher Lloyd started calling with their Atlantic steamers, being followed by their rivals, the Hamburg-Amerika Company. In the early 'seventies the Dutch companies followed the lead of the Germans, the Nederland and Rotterdam Lloyd lines calling at the port regularly. All these developments in trade necessitated more dock accommodation, and in 1890 the Empress Dock was opened by Queen Victoria. This was the last undertaking of the Southampton Dock Company and made the port the only one in Britain that could take ships of the deepest draught afloat at any state of the tide.

The Dock Company, however, was unable to equip the dock properly, having no reserve or working capital. The question therefore arose as to some other body taking over the docks. The Southampton Corporation voted against a proposal that they should become the dock owners, and the Harbour Board like-

Port of Southampton—continued

wise refused. The London & South-Western Railway Company, which had been loaning money to the Dock Company, eventually purchased the docks in 1892.

This acquisition of the Southampton Docks by the London & South-Western Railway Company (now the Southern Railway Company) has proved to be a factor very largely responsible for the remarkable progress achieved in the trade of the port during the past fifty years. Another factor was the initiative of the famous transatlantic shipping company, the American Line, which, by transferring its express New York service from Liverpool in 1893, started the movement which led to Southampton's supremacy as a terminal port for the North Atlantic passenger trade.

In the early part of the present century the railway company, as dock owners, carried out many schemes of dock extensions, the major work being the construction of the Ocean Dock, which was completed and opened in 1911, and eventually extensively used by the White Star Line, which had previously transferred its Atlantic services from Liverpool to Southampton.

In 1892, the year in which the railway company became owners of the docks, the total net tonnage of ships which used them was 1,196,203, and this increased by 205 per cent. to 3,657,782 tons in the year 1910.

Soon after the conclusion of the 1914-18 war, the growth in the amount of shipping at Southampton made it apparent that it would be necessary to increase the dock facilities, and in 1924 there was commenced probably the most ambitious scheme of dock extension ever undertaken in any port in this country when the Southern Railway Company commenced building a complete new system of docks. The site selected for this scheme was inland, not seaward, from the existing docks system on a bay on the River Test, about 2 miles long and half a mile wide, extending from the Royal Pier to Millbrook Point. The scheme included the construction of a quay wall about 1½ miles long, running from east to west, and the reclamation of 400 acres of land for the erection of sheds, warehouses and factories, and the provision of the many other facilities of a modern dock.

One of the most interesting phases of this new dock scheme was the dredging of a channel, about two miles long and at least 600-ft. wide, from the original swinging ground of the Ocean Dock up to the eastern end of the new quay wall and throughout its length. This involved the removal of 20,000,000 tons of material of various kinds. The soft clay mud with which the estuary is overlaid was taken to sea for disposal, and the stratum of gravel was utilised for making banks or concrete, while other material below the gravel was conveyed through pipe lines to the area to be reclaimed.

The basis of the quay wall itself was a long line of 146 concrete monoliths, each 45-ft. square, which were sunk to depths varying from 71 to 100-ft., and on these monoliths was built the continuous concrete quay wall of 50-ft. in width, with all the necessary crane tracks and railway lines.

Behind the quay were erected eight passenger and cargo sheds, built in pairs, each pair forming one continuous building, 150-ft. wide and varying in length from 1,274 to 1,666-ft. In the centre of each pair of sheds is a large buffet and lounge waiting-room. The quay is equipped with electric level-luffing cranes lifting two to five tons at a radius of 86-ft., and the whole estate is fully equipped with 26 miles of railway sidings, which are connected with the main lines at the western end of the estate and with the Old Docks and main line at the eastern end. In addition, there are approximately four miles of vehicular roads. Work on this huge docks extension scheme was finally completed in 1934. Thus additional quayside accommodation was provided for eight of the largest ships afloat in line, with a depth of water alongside half the quay of 45-ft. L.W.O.S.T. and for the remaining half a depth of 40-ft. L.W.O.S.T.

Future Dock Reconstruction and Improvements

The dock owners have already initiated important works of reconstruction and improvement, the most important of which will be the new passenger terminal at Ocean Dock for use principally in connection with the "Queen" vessels of the Cunard White

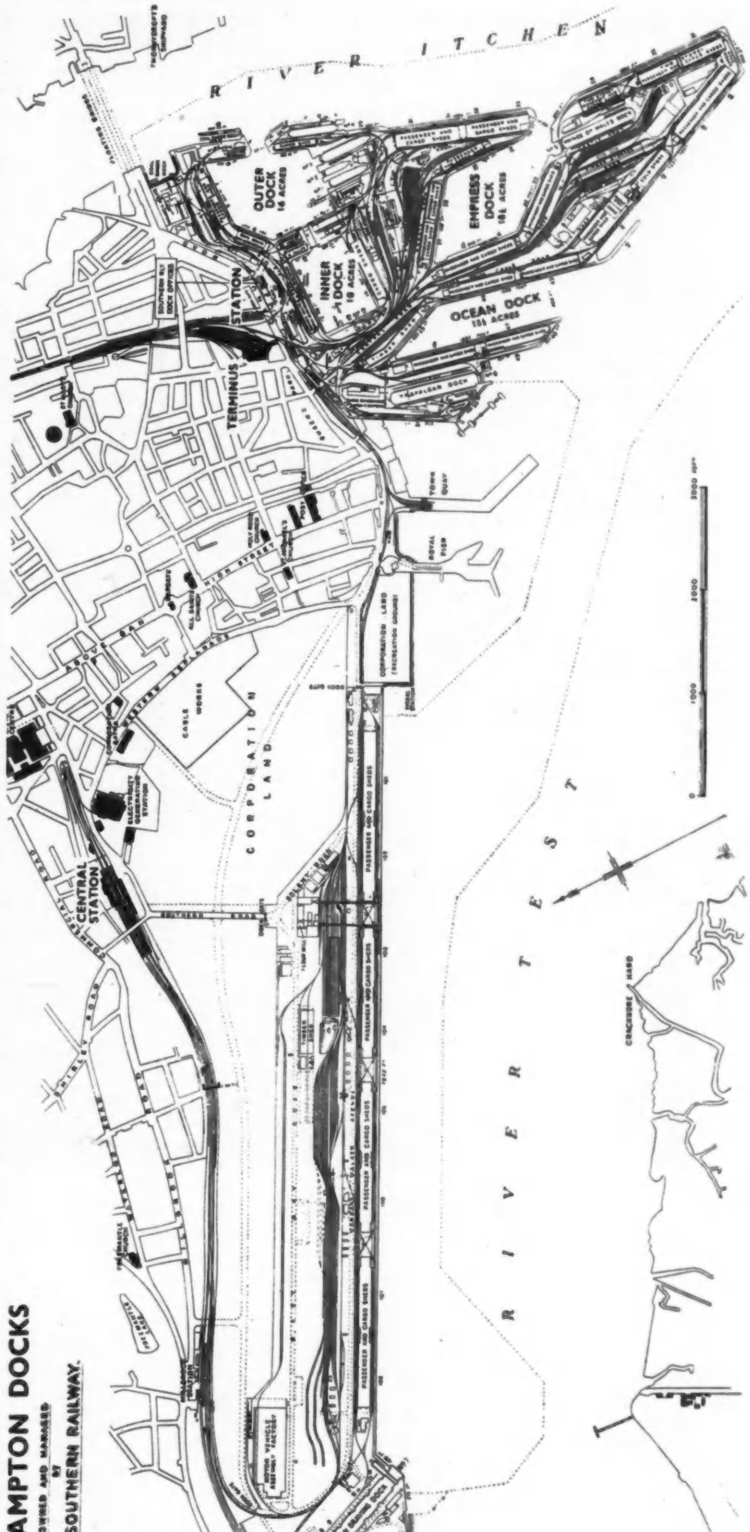


Fig. 2.

Port of Southampton—continued

Star Line. The new terminal building will cost £500,000, and will be one of the finest examples of its kind in the world, containing every modern device for the convenience and comfort of passengers.

Other improvement schemes include new warehouses, a large modern cold store, a new marine air terminal for B.O.A.C. flying boats, replacement of out-of-date quayside cranes, and the provision of 20-ton and 30-ton electric cranes at No. 5 and No. 7 dry docks.

Quay is shown extending for some distance from the Water Gate of the town walls. After the formation of the Harbour Commissioners in 1803, the accommodation at the quay for shipping was improved and extended, but it was not until 1853 that the first extension outwards to deeper water was made by constructing a wooden pile jetty 300-ft. long and 55-ft. wide. From time to time, various lengthenings and widenings have been undertaken, and modern warehouses and cranes and other quayside facilities have been provided.

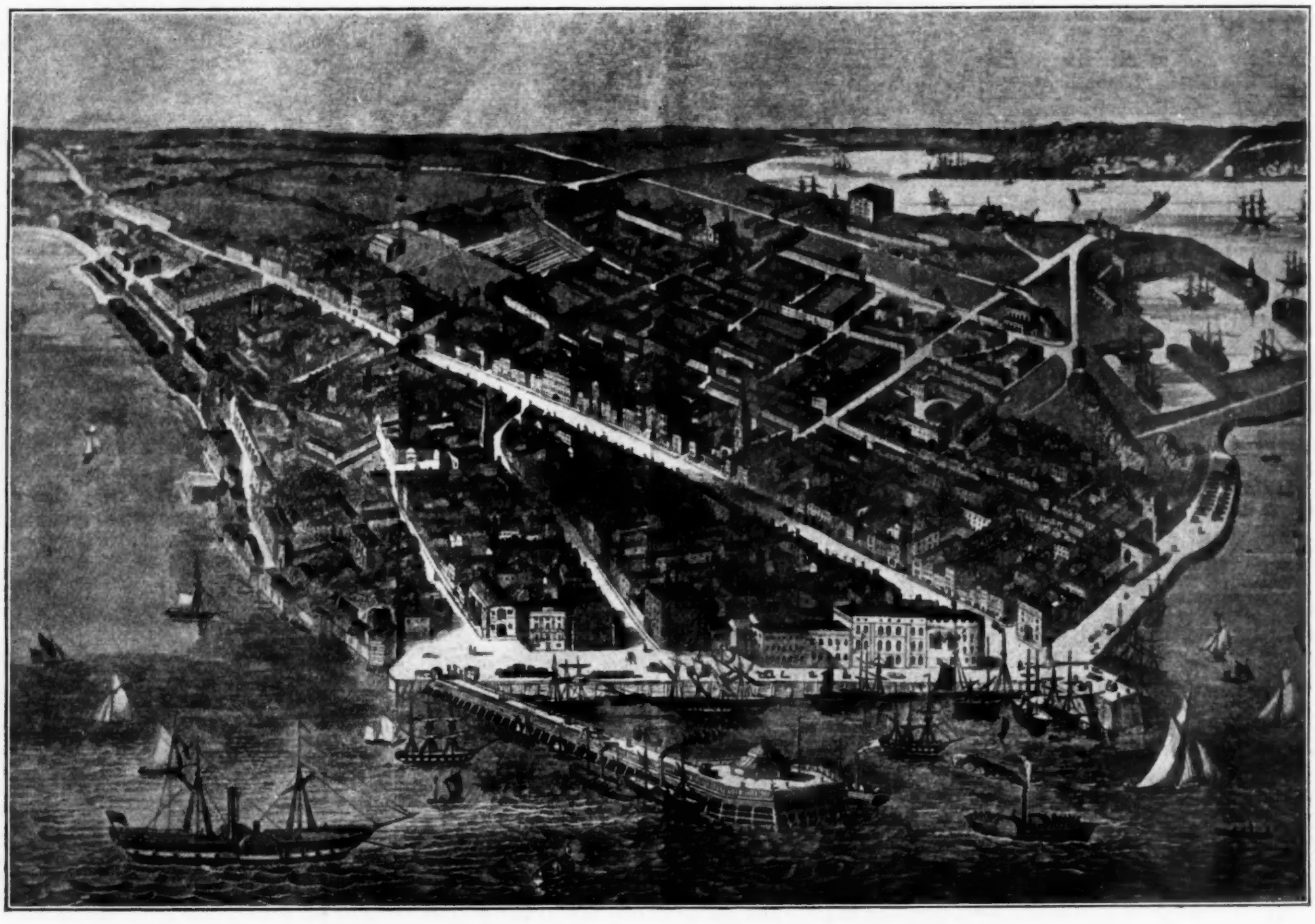


Fig. 3.—General view of Southampton, taken from the "Illustrated London News," 1844, showing Royal Pier and Town Quay, and, on the extreme right, the first docks.

Royal Pier and Town Quay

From 1842 to the opening of this century, when the docks of the port were being constructed and enlarged by the separate body owning them, the Harbour Commissioners, now the Southampton Harbour Board, were improving their Royal Pier and Town Quay. The old wooden pier of 1833 was replaced in 1892 by a modern structure upon iron screw piles, having ten deep-water berths and every facility for the handling of vessels and passengers. The Royal Pier is the largest in the south of England and covers an area of 3½ acres. A pontoon connected to the pier by vehicular and foot bridges enables vehicles and passengers to pass to and from vessels at any state of the tide.

The Town Quay is now a structure 1,500-ft. long and 150-ft. wide, extending out into Southampton Water from the side of the Old Watergate Quay at the end of the High Street. The date and style of the original structure are obscure, but it is probable that a jetty of some sort existed in the earliest times. A stone jetty with a hand crane was in existence at the beginning of the seventeenth century, and in eighteenth-century maps the Watergate

Port Conservancy

The depth of water in the main channels of the port remained as provided by nature until 1882, when the Southampton Harbour Board, as Conservators of the Port, were first given parliamentary powers to improve the channels by deepening. The first recorded dredging work of any magnitude was the removal of a part of the Netley Shoal to provide a depth of 26-ft., and the removal of the 18-ft. bar situated abreast of the Test Quays in 1888-89 so as to provide the necessary depths of water for the increasingly larger and deeper-draught ships then using the port.

In 1889, consequent upon the construction of the Empress Dock, the channel from Netley to the docks was dredged to provide throughout a least depth of 26-ft. at low water, and in 1893 the Board, fully realising the need for still deeper water, dredged the main channel from Fawley to the docks to 30-ft. In subsequent years the Board was continually maintaining the depths of the channels and improving the depths alongside the Board's own pier and quays, and when in 1907 the White Star Line transferred its Atlantic services to Southampton and commenced

Port of Southampton—continued

a weekly service to New York with the *Oceanic, Majestic, Teutonic* and *Adriatic*, it was necessary for the Board to deepen the main channel further to 32-ft., and also deepen a portion of the approach channel outside the port. This work was completed in 1909, but later in the same year the White Star Line decided to build the *Olympic* and *Titanic*, and further deepening of the channels and widening of the swinging grounds became necessary.

The next large dredging work of importance was occasioned by the establishment at Southampton of the Atlantic services of the Cunard Line and the coming to the port of such ships as the *Aquitania, Mauretania* and *Berengaria*, the latter drawing up to 39-ft. Between 1922 and 1927 the Board expended large sums on extensions of the swinging grounds, maintenance of the channels, and on the widening of the approach channel to the port at the West Bramble buoy and abreast of Black Jack buoy.

In 1931 the Harbour Board carried out the largest single dredging contract in its history, costing £270,000, under which the main channel from Fawley to the docks was widened from 500 to 1,000-ft. and deepened to 35-ft. at L.W.O.S.T. The entrance channel immediately outside the Board's jurisdiction was also deepened to 38-ft. L.W.O.S.T. over a minimum width of 1,000-ft. With the completion of this contract, the least depth of water in the channel from the Solent to the docks was 35-ft. L.W.O.S.T. or approximately 48-ft. at high water springs. Thus when the *Queen Mary* came into commission all the existing facilities at the Port of Southampton, including the depths of water, were adequate for this mammoth liner and the only new work necessary was a comparatively small extension of one of the swinging grounds.

The recent war caused the suspension of maintenance dredging and prevented the Board from putting into operation a scheme for improving the alignment of the main channels to tidal flow, although some dredging was carried out by the Government both in the approaches to Southampton and within the port itself to accommodate the deeper war-time draught of the "Queens."

The post-war years have found the Board as alert as ever to the needs of the ships of the port. In addition to schemes for deferred maintenance of channels, a large capital work has already been completed for extending and improving the swinging ground opposite the Ocean Dock used by the "Queens." Further plans include those for rectifying the main channel, with particular reference to tidal flow, and the turning radii of the longest ships using the port.

It will thus be seen that since 1888, when the first artificial depth was created, the Conservancy Authority of the port has made no mean contribution towards the improvement of the port, making it unparalleled among British harbours in its ability to accommodate at its quays the largest ships in the world. Many of the dredging works were carried out with the close co-operation of the dock owners.

Other conservancy duties of the Harbour Board include the buoying and lighting of the port and the provision of best possible aids to navigation. The lighting system chiefly employs gas buoys (now using propane gas), which is in accord with the International Uniform System of Buoyage and Lighting of Coasts.

The Harbour Board is at present considering the development of radio telephony and radar as further means of assisting the navigation of the port.

(By courtesy of Southern Railway Co.).

Fig. 4.—Southampton Docks about 1892, when taken over by the London & South Western Railway Company

Trade of the Port

Southampton is, of course, universally recognised as the premier passenger port of Great Britain, and, although the passenger trade predominates, the cargo trade of the port is one of great importance and of growing magnitude. In the years immediately preceding the recent war, the value of Southampton's cargo trade was only exceeded by three other British ports, viz., London, Liverpool and Hull. The present transitional period is not a fair standard by which to measure the status of the port's trade, so that it is necessary to refer to the pre-war figures for illustration.

The trade of the port can be divided into three sections:—

(1) Traffic dealt with at Southampton Docks.
(2) Traffic dealt with at the Town Quay and various wharves along the rivers Test and Itchen.
(3) Oil importations handled at the several large installations and jetties of the principal oil companies established at the port.

Of Southampton's total pre-war shipping trade, which aggregated about 2,500,000 tons of cargo per annum, about 45 per cent. passed through the docks, 40 per cent. comprised oil and kindred imports, and the remaining 15 per cent. was traffic dealt with at the Town Quay and the river wharves.

The cargo traffic passing through the docks comprises export traffic originating in the industrial midlands and the north and passing specially to Southampton to connect with the fast liners sailing to all parts of the world. Iron and steel, machinery, rubber products and hardware from the Black Country and Birmingham, woollens and cottons from Yorkshire and Lancashire, hosiery from Leicester, and leather goods from Northampton, together with a considerable quantity of goods in transit from

Port of Southampton—continued

near continental ports are despatched to such destinations as U.S.A., South Africa, Japan, India, Dutch East Indies, South America and Canada.

In the reverse direction, large shipments of deciduous and citrus fruits come to the port from South Africa, South America, U.S.A., Canada, Palestine, West Indies, Central America, Spain, Azores, Australia, New Zealand, France and Channel Islands, and also substantial shipments of frozen and chilled meat, and dairy and other produce from the Empire and South America. Large imports of grain and timber come from all parts of the world.

(By courtesy of Southern Railway Co.).
Fig. 5.—Modern Aerial View of part of Southampton Docks.

The greatest single commodity imported is oil, which comes from the principal world sources, including Central America and the Persian Gulf, and is brought in big tanker shipments to the Hamble and Fawley depots of the Shell-Mex and B.P. Company, Limited, and the Agwi Petroleum Corporation, Limited. The Port of Southampton is one of the chief centres for the importation and storage of fuel and other oils in the United Kingdom, and over one million tons of such oil is received annually, much of which is used for bunkering the liners using the port, the balance being distributed to meet petrol requirements in the southern area or processed for extraction of valuable by-products.

The portion of Southampton's freight trade carried on at the Town Quay is largely coastwise, and in pre-war years was about 150,000 tons per annum. Important British coasting lines are based at the Town Quay, and in pre-war years some continental lines brought wood goods and paper. There is a considerable general cargo trade between the Town Quay and the Isle of Wight. At the wharves in the rivers Itchen and Test, various commodities are handled, including substantial imports of coal and timber.

The embarkation and disembarkation of passengers has been a feature of Southampton trade since earliest times, and most ports of the world are normally linked up with Southampton through the services of more than twenty shipping companies, providing regular passenger communication with the United States of America, Canada, South Africa, South and Central America, Far East, New Zealand, Australia, East Indies, West Indies, Channel Islands, and the Continent.

The following figures show the pre-war growth of the passenger trade:—

Year		In	Out	Total Passengers
1913	...	178,158	200,759	378,917
1923	...	176,574	237,516	414,090
1928	...	228,839	275,798	504,637
1933	...	242,267	238,360	480,627
1938	...	268,507	291,919	560,426

For the first four months of 1947, nearly 100,000 ocean and cross-channel passengers were dealt with at the docks, which shows increases of 18 per cent. and 16 per cent. respectively over the corresponding periods of 1946 and 1938.

According to Board of Trade figures, 44 per cent. of the total number of persons travelling by sea between this country and places outside Europe travel via Southampton.

A considerable passenger traffic apart from the docks is centred at the Royal Pier, comprising travellers on the Southampton-Isle of Wight regular services and excursionists to South Coast resorts and to Cherbourg. Over 600,000 boat passengers pass over the pier annually.

In addition to passengers by sea, there was in pre-war days an increasing number of passengers entering and leaving Southampton by the flying boat services of the Imperial Airways (now the British Overseas Airways Corporation). This traffic will be revived at the port when the B.O.A.C. flying boat services return to Southampton this year.

The Port in War-time

As in peace, so in war has Southampton played an important part in the country's fortunes, and history records the many occasions on which its natural and established facilities have been of inestimable value to this country in time of war. At the time when King Alfred built some of his ships on the banks of the rivers at Southampton to repel the Danes, when the fleet of the Crusaders was partly assembled at the port under Richard Coeur-de-Lion, and in 1415 when Henry V marshalled his army here for the expedition against France and for the victory at Agincourt, Southampton was important as a naval and military station.

In more modern times troops for the Crimean, Zulu, and South African wars were mainly embarked at Southampton; and in the 1914-18 war Southampton held the proud position of being the No. 1 military port, when seven million service men, including the whole of the British Expeditionary Force, and 3,750,000 tons of stores, passed through the port.

The years of the recent war from 1939 to 1945 have been some of the most eventful in the history of the port, and it is impossible within the compass of this paper to deal adequately with the magnificent contribution made towards the war effort by all sections of the port. Only a few of the many phases of activity can be mentioned, but it must be stated that the foresight of the S. Rly. Co., as dock owners, in providing the new docks some years before, and the efficiency of the Conservancy Authority, very materially assisted in the preparations for the greatest military adventure in history, which culminated in the "D"-day Normandy operations.

The embarkation at the port in 1939 of the British Expeditionary Force, including 800,000 men and 300,000 tons of stores, was followed by the epic of Dunkirk, in which Southampton ships took part, and then by the closing of the port to all ocean shipping in view of its vulnerability to air and sea attack. During the latter time, shipyards and ship-repairing establishments, however, remained active.

The air attacks on the port and town, when the docks and harbour installations were special targets, are too well known to need comment, but mention must be made of the coastwise traffic which was maintained in spite of severe enemy air and sea attacks

Port of Southampton—continued

up to the re-opening of Southampton to ocean shipping early in 1942. From this time onward there was great activity and, with the establishment of a Port Headquarters for the United States Army (American 14th Major Port), supplies of stores, equipment and foodstuffs from many parts of the world poured into the port. Hards, to accommodate the special type landing craft, were constructed by using the centuries-old masonry from bombed buildings in the town as filling, and over these many thousands of the heavy tanks and specially constructed vehicles passed to and from the landing craft. In other parts of the port the jetty accommodation at oil installations was extended to cope with the very large number of craft which needed oil bunkers, and the berthage accommodation at buoys in open water to accommodate invasion craft, and special floating units, was multiplied many times.

One of the most intriguing of all the activities at this time was the work on the construction of the Mulberry Harbour, and Southampton, with its extensive port facilities, was chosen to play a foremost role in the building of this harbour. Contracts for the many and varied components were undertaken by firms in all parts of the country, but Southampton was a principal centre to which components were despatched for assembly purposes. In addition, a number of the large concrete caissons utilised to form a main part of the harbour breakwater were built and completed in the docks.

Some of the largest types of caissons were built in the dry docks, and when partly constructed were floated out to be completed at adjacent wet berths, thus making room for the erection of further units in dry dock. In this way a total of twelve caissons, each weighing 4,000 tons, were built. At the peak of the constructional period more than one thousand men were engaged on this job alone, and before the end of May, 1944, every one of these structures, whether wholly or partly built at the docks, had been despatched according to schedule in readiness to be towed across the Channel to take their place in the great prefabricated harbour.

Simultaneously other work connected with the assembly of components proceeded, involving the towing to Southampton of sections of the pierheads, etc., and the forwarding by rail and road of many thousands of steel units manufactured by firms in all parts of the country. Pontoons, known as "Rhinos," were also built here from prefabricated parts conveyed to the port by shipping. Nearly 8,000 prefabricated tanks were required for this work, and altogether thirty-nine complete pontoons with accompanying tugs constructed on the same principle were built.

During the memorable period before and after "D"-day, all Southampton's peace-time records were broken. For example, the military traffic handled at the docks alone in the first seventeen weeks following "D"-day exceeded in tonnage figures the commercial trade dealt with throughout the whole of the last complete pre-war year, and the total net tonnage of shipping entering the whole port in 1944 was nearly 26 million tons as compared with the pre-war record of 15 million tons. From "D"-day to "V.E."-day over 2,000,000 men of the United States forces were embarked at Southampton, together with their vast equipment, including 251,000 vehicles, trucks, tanks and armoured cars, and 21,545 railway trucks and locomotives. In all, the port handled 11,817,111 tons of cargo and 3,640,165 personnel in this operation alone.

(To be continued).

3,000-ton Floating Dry Dock for U.S. Coastguard

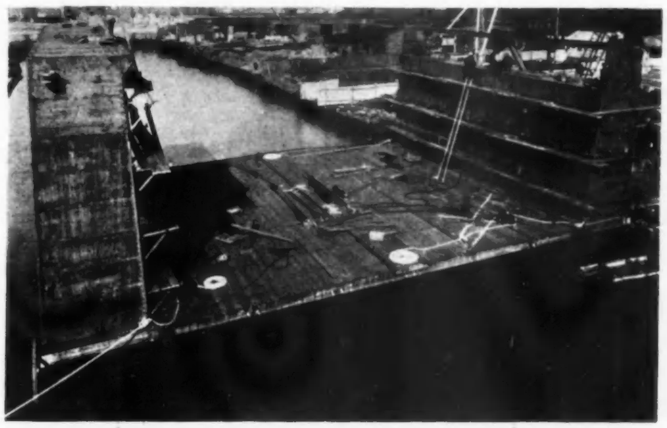
By J. STUART CRANDALL, B.S., C.E.*

Prophetically anticipating greater demands for ship repair and other activities, the United States Coast Guard Yard at Curtis Bay, Maryland, began planning the expansion of its facilities, including shops, piers, cranes and additional dry docking facilities, as early as 1940. It was decided to instal a 3,000 ton floating dry dock, adequate to accommodate the Coast Guard Cutters, of the Crandall longitudinally trussed sectional type with wood pontoons and steel wings, the subject of this article.

Longitudinally trussed floating dry docks have the simple self-docking feature of sectional docks, but instead of having the sections loosely joined by locking logs which provide no resistance in shear or moment, they are rigidly connected together by means of pins through steel castings at the top of the wings and bottom of the pontoons, forming the several sections into one unit. In this case, the dock consists of five sections, with a rated lifting capacity of 3,000 long tons at one foot freeboard, having the following principal dimensions:

Length over pontoons and keel blocks ...	300-ft.
Length over fantail	350-ft.
Width over all	84-ft.
Width, clear	64-ft.
Depth of water over keel blocks ...	20-ft.

The usual life-time of steel floating dry docks is about 30 years, 2[illegible] years in the tropics, while there are many wood floating dry docks which are 40 to 50 years old and still giving service. However, the wood wings of these floating docks frequently require re-calking and some repairs to the upper portion because of decay, while in the wood pontoons the frequent immersion in sea water acts as a rot inhibitor. The combination of wood pontoons and steel wings was therefore selected, to give the longer life-time and lower maintenance expense of wood pontoons and the greater advantages of steel wings. These wings being usually above water are readily accessible for cleaning and painting. The exterior surface of the pontoons is sheathed to provide protection against marine borers. Borers cannot live in the interior because of the lack of sufficient free oxygen to support marine life.



Steel Wings being erected on Wood Pontoon.

The pontoons are of rectangular cross section, except for the deck camber, to simplify construction and to permit the pump suctions to be located under the wings, thus avoiding long suction lines. They are constructed of long leaf yellow pine. The concentrated load along the keel is distributed uniformly across the width of the dock by means of transverse trusses carefully analysed to economise materials and minimise hand fitting. These consist of wood top chords, bottom chords and diagonals, with steel tie rods for the vertical tension members. Each pontoon is divided into four water-tight compartments by two central bulkheads, one longitudinal and one transverse. In addition, each water-tight compartment is further divided by means of three longitudinal wash bulkheads. The transverse bulkheads and the central longitudinal bulkheads are designed as girders to resist the imposed positive and negative bending moments. The exterior planking and water-tight bulkheads are all calked with white pine wedges.

*President and Chief Engineer, Crandall Dry Dock Engineers, Inc., Cambridge, Massachusetts.

3,000-ton Floating Dry Dock for U.S. Coastguard—continued

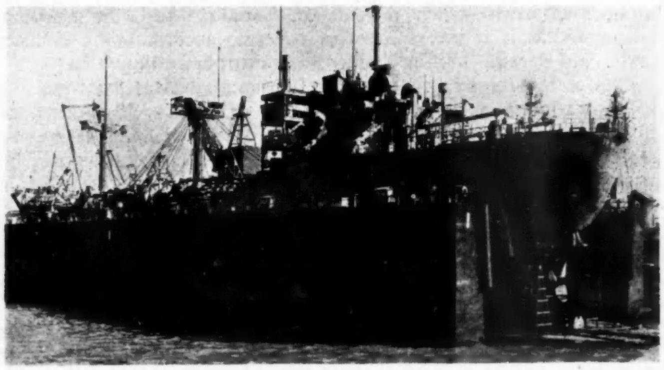
The wings are of welded construction, using mild steel plates and shapes. The wing plating is supported by scantling fastened to rigid transverse frames. The frames and compartments correspond to those of the wooden pontoons, to which they are permanently bolted. Incorporated in each wing is a water-tight safety deck, on which the pump motors and control equipment are located.

In the wing and pontoon of each section there is incorporated a panel of a Warren truss with an effective depth of approximately 33-ft., nearly the total height of the wing and pontoon. The top chord and diagonal members of these trusses are rolled steel shapes, while the bottom chords consist of timber compression members and steel tension members, the latter pre-stressed to reduce elastic deformation and truss deflection. These trusses terminate in steel castings at the panel points, with lugs which mate with those of the corresponding sections for connection by the steel pins already mentioned. To detach any section, it is only necessary to remove eight pins, after which it may be turned through 90° and dry docked on the remaining sections. These trusses are designed to give ample resistance in moment and shear for the unequal loading which is inevitable in dry docking and to minimise deflection of dock and vessel. For instance, a capacity vessel may be lifted which bears on only four of the five sections, the trusses acting to transfer the required buoyancy from the unloaded portions to the loaded part.

Pumping equipment consists of twenty 10-inch Peerless axial flow pumps, one to each water-tight compartment, direct-connected to vertical electric motors located along the motor deck, of sufficient capacity to dry dock a capacity load in 45 minutes. The control of these pumps is centralised in a control house ashore at the head of the dock. Above the control switch for each pump there is a water-level indicator of the Pneumercator type, giving the depth of water in the corresponding compartment. By this means, a single operator may control, as desired, the water levels in all of the compartments.

3,000-ton Floating Dry Dock (view from Control Room).

Each pump discharges through an interior gate valve and an exterior flap valve. The gate valves are opened at the start of each operation and then closed after the operation is completed. The dock is flooded through square sluice gates in the sides of the pontoons, one to each water-tight compartment, these of adequate size to sink to full draft in about 15 minutes. There is an emergency sluice gate through the central transverse bulkhead under each wing, connecting the adjoining compartments fore and aft, for use in case a pump should fail to function. By opening the emergency gate, the pump in the adjoining compartment can un-water both compartments. The operation of the sluice gates and valves, being infrequent, is done manually; the variation of internal water levels being controlled by the operator in the control house.



After Quarter View.

The value of the emergency sluice gates and the water level indicators was dramatically demonstrated during the first operation of the dock. Some minutes after the pumping had started, it was noted that the water level in compartment No. 10, starboard, was not dropping, indicating defective operation of that pump. The emergency sluice gate to the adjoining compartment was opened, permitting pump No. 9, starboard, to pump both compartments. After the docking operation was completed, examination of the pump in compartment No. 10 disclosed a suit of overalls wrapped around the impellor!

There are 32 sliding bilge blocks of the releasing type, moving on transverse slides, operated by galvanised chain and hand winches located along the wing deck. On this wing deck are located one electric capstan, seven hand-operated capstans, together with adequate bollards and cleats for snubbing and fastening lines. A loud speaker system provides communication between the control house and the wing decks.

The floating dock is moored to the adjacent pier by means of three guides, consisting of vertical H-beams fastened to the floating dock and brackets bolted to the pier structure with a hinged slipper which engages the flanges of the H-beams, providing scope for listing and trimming the floating dock, as may be required.

The construction of the several sections of this dock was started in the late spring of 1941, at a site on the bank of an inlet in Westport, Baltimore, where the necessary equipment was installed and launchways constructed. The pontoons were assembled in a horizontal position. The bottom chords of the longitudinal trusses were installed, the tension members pre-stressed, and all exterior outlets, valves and fittings installed. After each pontoon was launched, it was warped to an adjacent pier, where the steel wings were erected, the pumping machinery and electrical wiring installed. As the sections were completed, they were towed to Curtis Bay, where they were finally assembled, ready for operation in September, 1942, and the first vessel dry docked on September 17th. It has since been in constant use, performing yeoman service during the war period. From March to September, 1943, forty-three vessels were put in dry dock, one for 28 days with an average time in dock of $4\frac{1}{2}$ days.

This floating dry dock was constructed and installed under the direction of Commodore LeRoy Reinburg, Commandant of the Coast Guard Yard. The author was the consulting engineer for the design and supervision. The general contractor for the construction was the Tuller Construction Co., Red Bank, New Jersey, and Bethlehem Steel Co. sub-contractor for the steel wings.

The Construction of a Slipway for Vessels of 24,000 tons Displacement*

Modifications in Design

By ENGINEER JUAN DE ANGULO.

The above work at the Port of Valencia, Spain, having been completed in the three years succeeding the primary description of the project, the following article has been drawn up to indicate certain modifications which were introduced in the course of construction as an appendix to the original arrangement, and more particularly that of the apron, or approach, which, by reason of the special difficulties attaching to this class of work, constructed below the level of the sea surface, was the object of greater attention.

Only two modifications of importance, which involve no essential variation in the scheme, have been introduced during the course of the work. The first makes an increase in the number of piles driven in Zones III. and IV. and the apron, due to the nature of the ground met with in draining the recess formed by the sheet piling round the perimeter of the site, reducing the load on each pile to 25 tons, and the second, due to the requirements of the Union Naval de Levante, which has replaced the two arches shown at the head of the slipway by a commodious chamber devoted to the storage of tools, reducing slightly in this part of the work the over-all width of the slipway floor and the keel-blocks and sliding ways, which in view of future constructions required is widened from the 8 metres, as designed, to the 10 metres as realised, so obtaining greater security in the distribution of pressures, principally in the preliminary operations of slipping.

The tool compartment, by reason of the abnormal pressures which have to be supported by its roof, or rather the floor of that part of the slipway, has been closely studied by our colleague, D. Luis Janini Cuesta, who has proved a valued collaborator in the execution of this important undertaking.

A surcharge of 10 tons per sq. m. has been adopted, taking into account that, although there is no appreciable loading on the extremity of the slipway, it is an essential place for the deposit of chains, anchors, etc., material of small volume but heavy weight.

Nevertheless, in view of future requirements, which may entail an extension of the slipway, this zone has been designed for a surcharge of 70 tons per lin. metre on the piles and 35 tons on each supporting beam of the sliding ways.

This superload involved the construction of a stout floor casting supported on pillars, 3.60 metres apart longitudinally between axes, and 3.50 metres transversely at the extremities, the remainder being 3.00 metres apart.

The structure has been designed in reinforced concrete, with square pillars, those in the centre, coincident with the axis of the piled zone, of .80 metres side and the remainder of .60 metres. Between these pillars run longitudinal beams of 1.20 metres side, with a width equal to that of the pillars which they connect and transversely, coincident with the pillars, cross beams of .60 metres in height, over-all being imposed the floor slab of .40 metres thickness.

In calculating the dimensions adopted, the most unfavourable conditions have been assumed for the aforesaid loading and possible accidents during ship construction.

The central longitudinal beam which, by reason of coinciding with the axis of the piles, has to sustain the heaviest load, is reinforced unsymmetrically with 6 rods of 36 mm. diam. below and 4 rods of 22 mm. above; the intermediates less loaded, with the same diameter rods, reduce by one the upper and lower reinforcement, and the remaining beams are made with 4 rods of 22 mm. diam. below and 3 of 20 mm. diam. above. The reinforcement of the cross beams consists of 4 bars above and 4 below in the outer set and 6 bars in the central beams, all of 22 mm. diam.

The reinforcement of the remaining pillars consists of 12 bars of 22 mm. diam. in the outer ones and of an equal number of rods, but of 36 mm. diam., in the remainder.

All this assemblage rests on a raft calculated as floating like the other members of the slipway on the basis of a slab with ribs radiating in two directions, forming a quadrilateral of which the apices are concentrated at the pillars.

The thickness of the floor, properly so called, has been fixed at 0.50 metres, the height of the ribs at 1.50 metres, and the width at .80 metre. The reinforcement of the longitudinal beams is arranged symmetrically on a basis of five rods of 22 mm. diam. in the central beam and five rods of 22 mm. diam. in the outer beams. The two outer cross joists are reinforced for the central

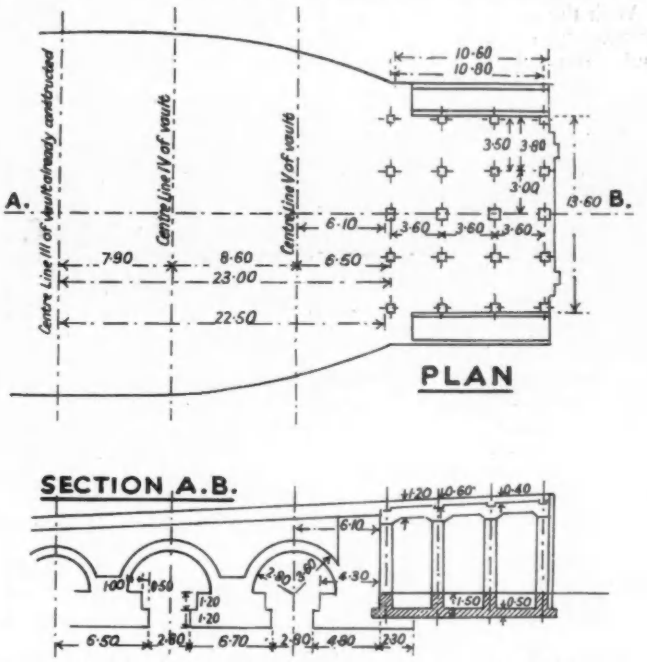


Fig. 1.—Modification introduced into the back part of the Slipway.

main beams with two rods of 28 mm. diam. below and with five of 22 mm. diam. above, and in the outer joists symmetrically, with five rods, upper and lower, of 20 mm. diam. The two intermediate transverse joists have 6 rods below and 4 above for the central beams and 5 rods of 20 mm. diam. below and 6 rods of 22 mm. diam. above for the outer beams.

The upper slab of the floor has 10 rods in two directions of 12 mm. diam. and the lower foundation bed has 8 rods of 12 mm. diam. per lin. metre equally in two directions.

The work was commenced with the driving of the first sheeting pile on Feb. 4th, 1943, the recess for the slipway proper being closed on the 24th Septr., 1943, after the driving of 577 piles.

The driving of the piles, whether for the slipway recess or the apron, offered no difficulty and was carried out by a Demag V.R. steam pile-driver fixed on the floating crane, *Hercules*, of 300 tons power, the height of its jib allowing the use of single guys, which could be easily fixed or dismantled, thus permitting the crane to operate without interference with the other works.

Having closed the recess for the slipway by the sheet piling, the next step was to fill it with sand brought from a beach at some 7 kilometres distance from the work, taking only 10 months for the 20,500 cubic metres of filling, thanks to the powerful appliances of the contractors, who provided cranes with scoops for digging the sand into hopper-wagons of 10 cu. m. capacity, which were rapidly transported by locomotives belonging to the contractors.

*Translated from the Spanish article in the November, 1946, issue of the "Revista de Obras Publicas." A pendant to a preceding article with the same title, translation of which was published in the June, 19[illegible], issue of "The Dock and Harbour Authority."

Construction of a Slipway for Vessels of 24,000 tons Displacement—continued

The spreading and consolidation of this sand, which formed the substance of the contract, was effected with the aid of copious supplies of water from an auxiliary service of pumps, giving rise to flooding and so amply proving the efficiency of the means employed, after having over-loaded an extensive zone with artificial blocks of concrete in mortar of those employed in the construction of wall which indicated an earthen over-load nearly equal to three times that adopted as the basis of calculation, but producing practically no settlement.

Thereafter were driven the piles in the dry simultaneously with the execution of the rest of the work.

Having completed the work of pile driving and filling, the remainder of the work of the slipway proper offered no difficulty otherwise than lack of supplies of material.

The construction of the apron presented more difficulties.

With the object of minimising the drainage, as indicated above, completely separate compartments were formed in the slipway and apron. As soon as the first was completed with its floor over all the surface, the partition of sheet piling which separated it was cut off.

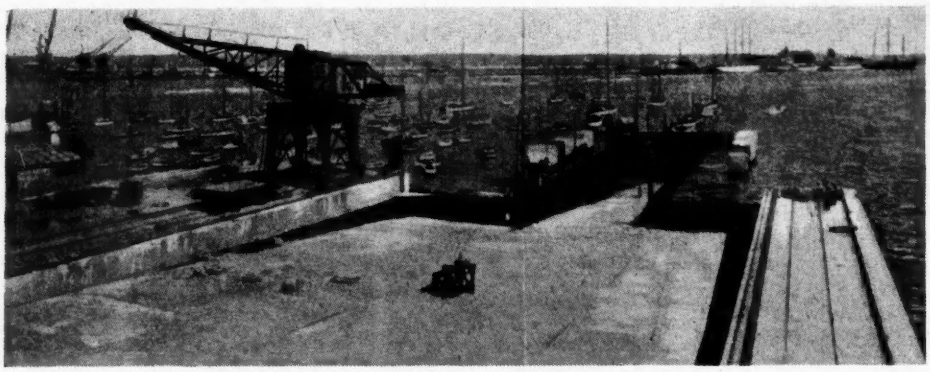


Fig. 2.—Slipway with Apron and Outer Sheet Piling.

In the formation of the apron there had to be taken into account the driving of an appreciable number of piles by means of a machine with a minimum height of 12 metres, determined by the length of the pile, and that the sheet piling curtains had to be formed to a fixed section because it was the only one available and that the pressure of the sea water against it was considerable, seeing that the height above the formation varied from 2 to 4 metres.

Rapid construction was a necessity, since it was inadvisable and uneconomic to prolong the drainage operations; for that reason it was necessary to seek a solution avoiding interior ties and shores in the enclosure, since these constituted serious obstacles to the manipulation of the pile-driver and subsequent concreting.

All this had to be achieved by giving the sheet piling support at its' extremities. Accordingly, the driving of the piles was increased to the maximum possible until there was obtained a consistent layer of earthwork which permitted driving to between 5 and 6 metres into the ground and so avoiding internal ties.

So that the sheet piling might not cause inconvenient projection and at the same time make possible the use of a single section from those at disposal, and having observed the results obtained in the tying of the sheeting for the slipway recess, properly so-called, a description of which was given in the earlier article of November, 1943, the same system of ties was adopted; but as in the slipway, the ties had to be located in the interior in order to resist the thrust of the sand filling in the direction from the inside outwards being greater than that of the water in the opposite sense; in the apron, by reason of drainage, the thrusts on the sides are those due to the sea and therefore inwards, which permitted of the placing of the rods with the same angular elements of 200 mm. arranged above, located outside, without causing any obstruction in the interior.

In order to resist the thrust of the water against the sides, each three rods were firmly secured to a block of concrete of 21,250 cubic metres, levelled at the foot by divers at —2 and leaving a margin above water level of about 10 c.m. The strength of the ties was calculated at 2.5 and 3.4 tons per lin. ft. of side, with water of the height of 3 and 4 metres. The distance apart of the rods was 3.20 metres, from which the stresses were respectively 24 and 32.640 tons and the resultant co-efficients of disturbance .67 and .90, taking the density of concrete at 1.7 below water. The first was acceptable, even although almost at the limit, and the second excessive. In order to confirm these co-efficients a test was made during drainage: up to a difference of level of 2 metres there was no dislocation of blocks and, moreover, the first two on each side (out of five) were unaffected, although following the drainage, the apron in front was bared. This was not so in the case of the other three blocks, in which were observed by tachimeter movements of the order of 3 to 5 c.m. in proportion to the difference in level, which attained as much as 3½ metres. In view of this there were placed on top of these three, other blocks, increasing the weight by $21.250 \times 2.40 = 51{,}000$ tons, which resulted in co-efficients of disturbance of .275 and .375 for the height in question, still within convenient limits of safety.

This arrangement, which is permissible for the lateral walls of the recess of the apron, could not be adopted at the front on account of the nearness of the entrance channel to the harbour necessitating taking the maximum precautions for coinciding in the deeper part of the work and in consequence the greater pressure on the partition.

The experience acquired in works of a similar character compelled steps to counteract the effects of the " renard "—the name by which is known the phenomenon of the creeping of the products of the floor where sheet piling had been driven, due to the difference of pressure where the drainage is undertaken, which causes a current of water, with consequent undermining of the piling, reducing the length of the piles driven—a cause of possible accident.

To avoid the exposure at the head of the slipway, there has been constructed a double screen of piles, increasing the driving where possible and filling the 6 metres of separation with sand. With this it is sought to give the water a considerable re-adjustment, in which it will lose its velocity and moreover its erosive force, while the sand filling which replaced the erosion testified to the locality of the undermining.

The results obtained were as expected, seeing that through lack of cement the works were paralysed, and for long periods, and the recess was drained without the least mishap.

The effect of the work was satisfactory, if account is taken of the difficulties of the present time with the compulsory stoppages by reason of the lack of essential materials, it being impossible to say that if the difficulties had not been encountered the delay in execution would not have been reduced to two years.

To give some idea of the importance of the work, the following items may be quoted:—

Reinforced concrete: 3,980 cu. m., with the use of 320 tons of steel rods of different sizes.
Mass concrete: 2,890 cu. m.
Masonry in concrete: 2,500 cu. m.
Steel piling: 10,800 lin. metres.
Apart from various other units of smaller volume.

The total cost of the undertaking, taking account of revision of prices and including accessory works which were not included in the original scheme, reached a sum of 4,651,825.18 pesetas, including contractor's profit, which demonstrates the economy of the system compared with other slipways in construction.

This important undertaking has been carried out for the Sociedad Iberian de Construcceion y Obras Publicas, D. Salvador Canals, the Engineer of the Union Naval de Levante S.A. being the Director.

Dock and Quayside Lighting

By C. H. NICHOLSON, M.I.E.E., M.I.Mech.E.

Introduction

THE artificial lighting of a dock may be regarded as being necessary for the following purposes: to prevent danger to personnel, to enable vessels to discharge or load cargoes, to guide ships into the dock entrance, and facilitate the movement of wagons, engines, etc., during the period of darkness.

These requirements call for special consideration on account of the particular conditions obtaining on docks generally, brought about by the different types of lighting required for roadways, quays, warehouses, cranes, coaling appliances, grain silos, graving docks and slipways, electric lighting being the only method of illumination to be considered.

In order to assist in the appreciation of the factors which differentiate good from poor or indifferent lighting, it may be desirable to briefly consider the act of vision, and in this connection, it may be stated that recognition of an object is by contrast, i.e., an illuminated object of light colour is seen against a background of darker colour and vice versa, this latter, if the illumination is low, being known as seeing by silhouette and is largely used for roadway lighting.

A further important fact is that the human eye adjusts itself to the degree of illumination, i.e., if this is high the iris (pupil) contracts, reducing the aperture in the same way as a camera lense stop, and also the retina becomes less sensitive, the reverse process taking place with low values of illumination, hence a person entering a poorly illuminated area from a brightly lighted area suffers from temporary reduction in vision due to the time required by the iris and retina to adjust themselves to the new conditions. Glare, which in effect is high intensity illumination due to the eye being in direct line with a light source of high brightness (direct glare) or high intensity reflected light (indirect glare) gives a similar effect, i.e., temporary reduction in vision.

To meet the above conditions a lighting installation should meet the following requirements:—

(1) (a) Illumination of the working plane should be sufficient.
(b) The colour of the light should be such that the colour perception is possible (if this latter is necessary).
(c) There should be an absence of both direct and indirect glare.
(d) Deep shadows must be avoided.
(e) The illumination of the working plane should be reasonably even in intensity.

Before dealing with the above requirements in detail, in order to assist in the interpretation of the terms used in electrical and illumination engineering, definitions of the most used terms are given below:—

Direct Current (D.C.):—An electric current which passes around the circuit in one direction only, i.e., from the positive pole to the negative pole of the electricity source.

Alternating Current (A.C.):—An electric current which alternates forwards and backwards around the circuit. The usual number of alternations per second of alternating current supplied by electricity supply undertakings is 50 per second.

The Single-Phase System:—A simple alternating current system having two conductors for the purpose of affording an electric supply, and is used for all two terminal apparatus as electric lamps, heaters, single-phase motors, etc. As the voltage and current are both alternating, the watts and therefore power are also pulsating in nature analogous to a single-cylinder engine, the power from which is pulsating.

The Three-Phase System:—This is in effect three super-imposed single-phase systems and requires three conductors in order to afford an electricity supply. As the alternating currents in the three single-phases are displaced from one another by 120°, the analogy in this case is a three-cylinder engine having three cranks displaced from one another by 120°. The power is thus continuous and not pulsating as in the single-phase system. The advantage of the three-phase system for the distribution of electricity for lighting purposes is the reduction in the size of the conductors (cables) required for a given electrical load. The electricity service for lighting circuits which must of necessity be single-phase is obtained by using each of the three phases separately, the ratio between the single-phase and the three-phase voltages being 1 : 1.732, hence on a standard three-phase distribution system used for lighting and power service the three-phase voltage is 400 and the three-phase (lighting) voltage is $400 \div 1.732 = 230$.

Volt.:—The electrical pressure or electro-motive force between the positive and negative poles of a D.C. electricity source or between the terminals of an A.C. source analogous to the pressure of water in a hydraulic system.

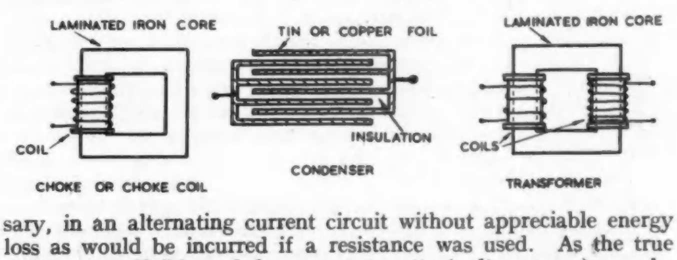
Ampere:—A measure of the quantity of electricity flowing per second in any electric circuit analogous to the quantity flowing in a hydraulic system.

Resistance:—As the name implies the property of conductors which causes resistance to the passage of an electric current analogous to the friction of pipes opposing the flow of water through them. The resultant loss of pressure (voltage) due to the resistance of a conductor resistance of a conductor is an energy loss and appears as heat. The incandescent filament in the tungsten lamp for instance, is an example of the condition where the whole of the voltage available is absorbed in forcing the current flowing in the filament through the resistance offered by the filament itself, the result being that the energy loss appearing as heat is sufficient to raise the filament in incandescence. The resistance of any conductor whether it be a lamp filament as above or an electric cable, is dependent upon (a) the material of which it is composed, (b) inversely as the area of the conductor, and (c) the length. The material having the least resistance is silver with copper following very closely. High resistance metals are iron, platinum, etc., particularly the alloys of iron.

Watt.:—The power represented by a current of one ampere at a pressure of one volt or any other values whose multiple is unity flowing in an electric circuit—1,000 watts equal one kilowatt and 746 watts equal one horse-power. One kilowatt for one hour is one kilowatt hour briefly referred to as one unit. The above applies to direct current only, the watts in an alternating current circuit being equal to the multiple of volts, amperes and power factor.

Power Factor:—The ratio between true watts and apparent watts (volt amperes) in an A.C. circuit and has for an electric circuit comprising resistance only, a value of unity. Actually, a circuit containing resistance only is difficult of achievement in practice, a near approach being a tungsten filament lamp which has a power factor of approximately .98.

Choke or Choking Coil:—Essentially an electro-magnet as shown in the diagram below, used for reducing the voltage, where necessary, in an alternating current circuit without appreciable energy loss as would be incurred if a resistance was used. As the true watts are negligible and the apparent watts (volt-amperes) may be appreciable, the power factor is necessarily low.



Condenser:—Apparatus used for the purpose of improving the power factor of a circuit, and usually consists of alternate layers of tinfoil or similar thin metal interleaved with an insulator such as mica or paraffin waxed paper.

Transformer:—This may be regarded as a choking coil having two entirely separate windings, one of which is connected to a

Dock and Quayside Lighting—*continued*

source of A.C. and referred to as the primary. The other winding termed the secondary may be utilised as a source of A.C. at a voltage differing from the primary A.C. source voltage, e.g., the primary, if for use on a standard A.C. supply, may be designed for connection to a 230 or 400-volt supply, the secondary may deliver A.C. at any voltage within reason, for instance, for hand lamp service this may be 25 to 50 volts. The transformer thus constitutes a convenient and static apparatus for the purpose of transforming the voltage of A.C. with extremely small loss.

Candle Power (mean spherical):—The average candle power in all directions of a light source, the original source being a standard sperm candle burning 120 grains of sperm wax per hour.

Foot Candle:—The intensity of illumination on a surface, a uniform point source of candle power one foot distant from every part of an area of one square foot will illuminate this area to an intensity of one foot candle, one lumen per sq. ft. if evenly distributed is also one foot candle.

NOTE.—Following the decision of the International Committee of Weights and Measures, the National Physical Laboratory will on and after January 1st, 1948, express all values in terms of units based on the "new candle." This unit of luminous intensity is of such a magnitude that the brightness of a black body radiator at the temperature of solidification of platinum is 60 new candles per square centimeter.

Lumen:—The unit of luminous flux and is equal to the light flux upon a surface of one square foot every part of which is at a distance of one foot from a uniform point source of one candle power, thus it may be deduced that a uniform point source of one candle power emits 4 π (or 12.57) lumens, hence mean spherical candle power x 12.57 equals lumens.

Brightness:—The luminous intensity per square inch or square centimeter of a surface either emitting or reflecting light, for example, a surface reflecting 70% of the light falling upon it and illuminated to an intensity of 10-ft. candles has a brightness of 7 foot candles.

Working Plane:—The plane upon which the intensity of illumination decided upon is required, as examples, a coal hoist wagon platform, the surface of a roadway or the floor of a warehouse.

Mounting Height of Lighting Fittings:—The vertical distance in feet from the centre of the lighting fitting or lantern to the working plane.

Spacing Ratio of Lighting Fittings:—The ratio between the horizontal distance between the fittings and the mounting height. Modern lighting fittings are so designed that providing this ratio is as specified for the particular type of fitting used, the lighting intensity on the working plane will be reasonably even, the minimum illumination not being less than 70% of the maximum intensity.

Light Absorption:—When light is reflected from a surface, whether this be a wall, ceiling or the surface of a reflector fitting, some light is lost due to absorption. This loss is greater the darker the colour of the reflecting surface. As examples, a reflector of silver plate reflects approximately 90% of the total light falling upon it, white enamel about 70%, whereas a dark coloured surface such as a brick wall may only reflect 10%, the remaining 90% being absorbed. Similarly, when light passes through translucent materials such as glass, white plastic, opal glass, the amount of light transmitted is from 90% for clear glass to 15% for thick opal glass. Such absorption is inevitable when translucent glassware or plastic is used for the purpose of providing a diffused light for the prevention of glare and minimising shadows.

Monochromic Light:—Daylight, as is well known, is made up of the colours of the spectrum, a monochromic light, however, has merely one colour band of the spectrum, and colours viewed in monochromic light are therefore badly distorted. Whilst few light sources, the exception being the sodium lamp, give monochromic light, the mercury lamp does give a light extremely deficient in red, hence colour distortion is great.

Co-efficient of Utilisation:—The proportion of the light flux produced by a lamp which raeches the working plane and is usually expressed as a decimal. This co-efficient takes into account the losses due to light absorption by walls, ceilings and the lighting fitting itself. The greater the mounting height of the fitting, the darker the walls and ceiling and contents of an interior, the less is the value of the utilisation co-efficient. Large interiors have a larger co-efficient than small rooms, and the use of light coloured ceilings and walls increases the co-efficient.

Depreciation Factor:—A factor following an increase in the initial lamp lumens output in order to ensure that the designed foot candles illumination will be maintained after all exposed surfaces of fittings, lamps, walls, ceilings, have become coated with a film of dust and dirt, this in effect reducing the co-efficient of utilisation. If lamps and fittings are cleaned approximately every six weeks, the factor has a value of 80%.

Absorption Factor:—This is a factor for the purpose of taking account of the nature of the atmosphere in which lighting is used. For instance, in the majority of interiors, the atmosphere may be regarded as reasonably clear, and the factor has a value of 1, but in the case of coal hoists shipping dry coal where a considerable amount of dust may be present in the atmosphere, an absorption factor of 0.5 would be quite justifiable.

Types of Light Sources

Until about the year 1920, the lighting of large areas such as docks, was almost entirely by arc lamps, the light being produced by the passage of an electric current between the ends of two carbon rods when separated a short distance after initial contact. The light being emitted jointly from the incandescent ends of the carbon rods and the arc itself, electro-magnetic mechanism feeding the carbons forward as they are consumed. Whilst the efficiency of the arc lamp is high, in the order of 2.5 candle-power per watt, it has the disadvantage of requiring recarboning and cleaning at fairly frequent intervals involving considerable personnel for a large installation. Many devices such as enclosing the arc almost hermetically, which incidentally lowered the efficiency, or providing a carbon rod magazine with the attendant mechanism which complicated the lamp, were developed in an attempt to reduce maintenance and attention, but with the advances made in the manufacture of the gas-filled lamp having a drawn tungsten filament enabling wattages of up to 1,500 per lamp being obtained, the arc lamp became almost obsolete for public lighting.

The forerunners of the gas-filled tungsten filament lamp, are, the carbon filament lamp, the tantalum filament lamp and the vacuum type tungsten filament lamp.

The carbon filament lamp on account of low efficiency (0.25 to 0.35 candle-power per watt) is now only used for special purposes, such as for indication and resistance units. Further, on account of the low efficiency it is commercially difficult to manufacture high candle-power carbon lamps, for instance, a carbon filament lamp capable of giving the same candle-power as a 1,500-watt gas-filled tungsten filament lamp would absorb approximately 4.5 kilowatts, and in consequence the dissipation of the heat generated would present a problem.

The tantalum filament lamp showed some improvement in efficiency, this being about 0.65 candle-power per watt, and was followed by the tungsten lamp which had an efficiency of approximately 0.8 candle-power per watt.

All the incandescent filament lamps enumerated above were of the vacuum type, i.e., the glass bulbs enclosing the filament were exhausted of air, and this precluded them being made in large sizes on account of the difficulty of dissipating the heat.

The gas-filled tungsten filament lamp, as the name implies, comprises a tungsten filament brought to incandescence and enclosed in a glass bulb containing an inert gas, the heat conducting property of the latter making the commercial manufacture of lamps of large candle-power possible. The efficiency is higher the lower the voltage and the greater the wattage and for 200-250-volt 200-watt lamps is about 1.15 candle-power per watt.

Recently, the fact that an electric discharge through a rarified gas, i.e., one at a much lower pressure than atmospheric pressure, causes this to glow, has been used to develop the discharge lamp which has the highest efficiency of any form of electric lamp so far produced, the high efficiency obtained being due to the lamp giving a much higher proportion of the energy supplied as light instead of heat.

The three commercial types of discharge lamps are Mercury Vapour Lamp, Sodium Vapour Lamp and the Fluorescent Lamp.

Dock and Quayside Lighting—continued

The first-named operates upon the principle of the conduction of an electric current through rarified Mercury Vapour, thus causing the Mercury Vapour to glow and give the familiar greenish light. The Sodium Vapour Lamp operates in a similar manner, the sodium being vapourised by the heat produced by the current passing through the gas, and thus glows giving an almost monochromic yellow light. The fluorescent lamp is in effect a Mercury Vapour Lamp the inside of the envelope being coated with fluorescent powder which, when subject to the ultra-violet emanation emitted by the Mercury Vapour Lamp fluorescences, giving a light of colour dependent upon the nature of the fluorescent powder.

All the above lamps are provided with a filling of argon or neon which initiates the electric discharge in the first instance.

Because of the recent advances in the development of electric lamps, the light sources are now described in detail commencing with the gas-filled tungsten filament lamp, and concluding with a table summarising the technical data of all types of light sources in use.

The Gas-filled Tungsten Filament Lamp

This lamp, as briefly mentioned previously, consists of a drawn tungsten wire filament heated to incandescence by the passage of an electric current, the working temperature being in the range of 2740-2980° C. If even a tungsten filament is heated to this temperature in air it will burn by combining with the oxygen of the air, therefore, in order to prevent this the filament was originally enclosed in a glass bulb which had been exhausted of air, this being the vacuum type lamp. In order to reduce the tendency of the filament to disintegrate and allow higher filament temperatures and hence a higher efficiency the vacuum is substituted by an inert gas, hence the name, gas-filled tungsten filament lamp.

The advantages of the tungsten lamp are:

(a) It is relatively inexpensive.
(b) No additional apparatus is necessary for operation.
(c) No power factor of the lamp on alternating current is approximately unity.
(d) It will function on either A.C. or D.C.
(e) The lamp is relatively small for large lumen outputs.
(f) Colour distortion is almost absent.

The disadvantages are:

(a) The greater portion of the energy input is dissipated in heat; therefore, the efficiency is not so high as the mercury, sodium and fluorescent lamps.
(b) The brightness is high being in the order of 1,000 candle-power per sq. cm.

The Mercury Vapour Lamp

As previously indicated this lamp operates due to the fact that when an electric current passes through a rarified gas, i.e., one at low pressure, molecular exitation causes the gas to glow. The gas in this case is mercury vapour produced by the vapourisation of a small quantity of mercury by an initial electric discharge through argon gas.

For this reason, lamps of this type are often referred to as discharge lamps.

The lamp in practical form consists of an inner bore sillicate glass tube provided with two main electrodes and one starting electrode, the tube being filled with argon gas and a small quantity of mercury. This tube is contained in an outer glass envelope which is exhausted to thermally insulate the inner tube.

Due to the relatively low voltage, 200-250-v. upon switching on, the lamp would not normally commence to operate, therefore, the starting electrode placed a short distance from one main electrode, is energised from the supply to the opposite electrode, a resistance of about 50,000 ohms being inserted in the starting electrode circuit. The voltage gradient between the main electrode and the starting electrode is sufficient to start electric discharge by ionisation through the argon gas which heats the main electrodes. This causes the mercury to vaporise and the electric discharge now takes place through the mercury vapour and the lamp is lighted. This operation takes about one minute and to attain full light output takes about 5 minutes. The light emitted is extremely deficient in red rays and hence colour distortion is apparent. This, of course, is generally unimportant except for colour recognition.

The power factor of the lamp is less than unity and the use of the stabilising choke reduces this to about .5 (lagging). As most supply authorities ask for a minimum power factor of .8 or thereabouts, a corrective condenser is necessary.

The dual lamp which is designed for the purpose of minimising colour distortion is essentially a gas-filled tungsten filament lamp and a mercury lamp operating in series, the tungsten filament lamp serving the dual purpose of acting as a stabiliser, and giving at the same time some colour correction by supplying the red and yellow bands of the spectrum. The 400-watt, 250-watt and the dual types must be used in a vertical position.

NOTE.—The mercury vapour lamp generally requires 100% current in excess of the normal current value during the starting period.

The advantages of the mercury vapour lamp are:

(a) The efficiency is high.
(b) The brightness is fairly low being in the order of 150 to 800 candle-power per sq. cm.
(c) Due to the high efficiency the size of the electricity supply cables may be less than a similar gas-filled tungsten filament lamp installation.
(d) The lamp has a long life.

The disadvantages are:

(a) Normally, operation on A.C. only is possible, but by the use of stabilising resistance and reversing switch D.C. operation is possible.
(b) Relatively high cost.
(c) Apparatus extraneous to the lamp itself is necessary, i.e., choke and condenser.
(d) The lamp is less compact than the gas-filled tungsten filament lamp.
(e) Colour distortion is apparent.

The Sodium Lamp

The elementary principle of this lamp is the same as the mercury vapour lamp, and in practical form consists of a long tube usually bent into a " U " shaped filled with neon gas and having a small quantity of sodium included. As the temperature required to vaporise the sodium is high, the " U " tube is enclosed in a double vacuum flask in order to reduce heat losses, and is provided with two oxide coated electrodes, the internal support acting as the auxiliary electrode used during the starting period. Initiation of discharge is brought about by the use of the purpose of initiation a transformer having a secondary voltage of about 480-volts is utilised. As the temperature rises due to the passage of current through the neon gas, the sodium is vaporised and the lamp operates as a light-giving source, the transformer voltage being automatically reduced until the lamp current is stabilised.

The light emitted is almost monochromic and hence colour distortion is great. As in the case of the mercury vapour lamp, the power factor of the lamp and stabilising transformer is low (about .3), therefore a power factor correction condenser is essential. The lamps, with the exception of the 45-watt size, must be used horizontally and fireproof packing is necessary in transit as in the event of breakage, exposure of the sodium to air and moisture may cause fire.

The advantages and disadvantages of the sodium lamp are similar to those of the mercury vapour lamp, with the additional disadvantages that (a) the lamp must be operated horizontally, necessitating the use of special fittings, (b) colour distortion is great, (c) special fireproof packing is necessary in transit.

The Fluorescent Lamp

This lamp is essentially a mercury Vapour lamp designed to emit a minimum of light and maximum ultra-violet emanation. The inside of the tube is coated with a fluorescent powder which when excited by the ultra-violet emanation emits light. The

Dock and Quayside Lighting—continued

fluorescent powder may be mixed to give almost any colour of visible light. At the present time two standard colours are available i.e. white and daylight. The standard lamp which is 5 feet long is provided with two oxide coated electrodes which are also heated for the purpose of starting discharge. In order to facilitate commencement of the discharge, the tube has a quantity of argon gas introduced in addition to the mercury necessary for the production of mercury vapour.

The operating voltage of the tube is in the order of 110 volts, but for the purpose of starting the electric discharge a voltage higher than supply voltage is requisite. Starting is brought about by the following sequence:—

Upon switching on, the current flows through the choke and heater electrodes, which, when heated, emit electrons, after a short period the starter switch opens and breaks the circuit, thus inducing a momentary high voltage surge across the choke and hence between the electrodes which is sufficient to start the discharge.

Starter switches may be of the glow or thermal type. With the former, the contacts are normally open, but upon the current being switched on the glow discharge taking place in the helium gas contained in the starter bulb heats a bimetal strip causing these to make contact and pass current through the electrodes of the lamp. The discharge through the argon gas short circuits the glow starter, the bimetal strip cools and opens, giving the necessary high voltage surge because of the inductive effect of the choke.

The thermal type of starter is provided with bimetal strip controlling contacts which are normally closed upon the starting current flowing through the starter, the bimetal strip opens the contacts again causing a high voltage surge as in the glow type of starter.

As indicated above, a choke is incorporated in the circuit in order to stabilise the lamp; further, on account of the low power factor, a correcting condenser is necessary.

The advantages and disadvantages of the fluorescent lamp are similar to those of the Mercury and Sodium Vapour Lamps with the following modifications. The lamp has the additional advantages of a very low brightness, .65 candle power per square centimetre and colour distortion is only slight, but has the additional disadvantage of being of large size and consequently somewhat fragile. A further disadvantage when used for the lighting of large areas, as a roadway for instance, is that as the lamp at present manufactured has a maximum lumen output of 3040 lumens, this necessitates the use of three to five lamps in one fitting which requires a rather large and expensive fitting or lantern.

Notwithstanding the apparent disadvantage of the mercury, sodium vapour and fluorescent lamps, on account of the high efficiencies obtained it is probable with advances in design and manufacture, these lamps will eventually supercede the incandescent filament lamp. For convenience, the technical data of the light sources described is given below, together with operating costs:—

TABLE I
Standard Incandescent Lamps, pearl and clear

Watts	Type	Dimensions Length m/m	Dimensions Diameter m/m	Light Centre Length m/m	Standard Cap	Minimum average Lumens throughout life at 110 v. Single coil	at 230 v. Single coil	at 230 v. Coiled coil
15	Pearl	92.5	55	65	B.C.	133	113	—
25	,,	100	60	70	,,	228	206	—
40	,,	110	60	80	,,	449	330	389
6C	,,	117.5	65	85	,,	759	584	665
75	,,	125	70	90	,,	1000	785	883
100	,,	137.5	75	100	,,	1400	1160	1270
150	,,	160	80	120	,,	2230	1970	—
200	Clear	178	90	133	E.S.	3090	2725	—
300	,,	233	110	178	G.E.S.	4950	4434	—
503	,,	267	130	202	,,	8950	7930	—
750	,,	300	150	225	,,	14270	12740	—
1000	,,	300	150	225	,,	19640	17800	—
1500	,,	335	170	250	,,	30220	28380	—

Courtesy of E.L.M.A.

TABLE II
Electric Discharge Lamps. (200-250 v. A.C.)

Type and Wattage		Bulb Shape	Dimensions Length m/m.	Dimensions Diameter m/m.	Power Loss in control gear. Watts approx.	Average Lumens throughout life	Cap.
Mercury (MB/V)	80	Pear	160	80	10	2240	3-pin B.C.
,,	125	Pear	178	90	12	3750	3-pin B.C.
,, (MA/V)	250	Tubular	290	48	15	7250	G.E.S.
,, ,,	400	Tubular	330	48	20	13600	G.E.S.
Flu./Mercury (MBF/V)	80	Pear	178	110	10	2240	3-pin B.C.
,, ,,	125	Pear	233	130	12	3750	G.E.S.
,, (MAF/V)	400	Isothermal	335	165	20	12800	G.E.S.
Tub./Flu.Mercury (MCF/U)	80	Tubular	5ft.	$1\frac{1}{2}$ins.	10	3040	B.C. each end.
,, ,,	40	Tubular	4ft.	$1\frac{1}{2}$ins.	12	1720	Bi-pin each end.
Tung./Mercury ,, (MAT)	300	Tubular	285	85	—	5400	G.E.S.
,, ,,	500	Tubular	380	100	—	10500	G.E.S.
Merc./Black bulb (MBW/V)	80	Pear	178	90	10	—	3-pin B.C.
,, ,,	125	Pear	178	90	12	—	3-pin B.C.
Sodium (SO/H)	45	Tubular	238	50	20	2000	B.C.
,, ,,	60	Tubular	300	50	20	3120	B.C.
,, ,,	85	Tubular	415	50	20	4850	B.C.
,, ,,	140	Tubular	518	65	25	7980	B.C.

Courtesy of E.L.M.A.

Comparison of Operating Costs

	Mercury Vapour v	Tungsten.
Tariff.	Flat rate of 1d. per unit.	
Lamp (equivalent light output)	400 watt standard. mercury	1000 G.S.
Control Gear loss.	20 watts.	
Total Watts.	420 ,,	1000
Running Costs for 1000 hrs. burning.	$\frac{420 \times 1000 \times 1}{1000 \times 12}$	$\frac{1000 \times 1000 \times 1}{1000 \times 12}$
=	35 shillings	83.34 shillings
Lamp replacements (excluding labour costs)	$52.5 \times \frac{1}{3}$	
=	17.5 shillings	16 shillings
Total Operating costs per 1000 burning hours. =	70.0 shillings	141 shillings

NOTE.—400 w. mercury lamps have an average life of 3000 hours, therefore only 1/3rd. the cost being taken.

Camparison of Operating Costs

	FLUORESCENT TUBES	TUNGSTEN LAMP
TARIFF. £3 per kVA of M.D. per quarter plus 0.75d- per unit.		
Lamp (approx. equivalent light output)	80 watt 5 ft. Fluorescent Tube	200 watt G.S.
Control gear loss	10 watts	—
Total watts	90 ,,	200 watts
Power factor	0.9 lagging using condenser	unity
kVA	.1	.2
Maximum demand charge per quarter	6 shillings	12 shillings
Lamp replacement costs (excluding labour)	$24 \times \frac{1}{3}$ = 8 shillings	2.75
Running costs per 1000 hours ...	$\frac{90 \times 1000 \times 0.75}{1003 \times 12}$ = 5.625 shillings	$\frac{200 \times 1000 \times 0.75}{1000 \times 12}$ 12.51 shillings
Total operating costs per 1000 burning hours	19.625 shillings	27.26 shillings

NOTE—Mercury fluorescent tubes have average life of 3000 hours, therefore only one-third cost taken.

The Choice of the Type of Light Sources

For a dock installation the choice of the light source to be used must be made for each section, but the factors to be considered may be summarised as follows:—

(a) The cost of electricity for each type of source.
(b) The cost of re-lamping, bearing in mind the difference in the relative life of the types of lamp under consideration, e.g. the life of mercury/sodium vapour or fluorescent lamp is

Dock and Quayside Lighting—continued

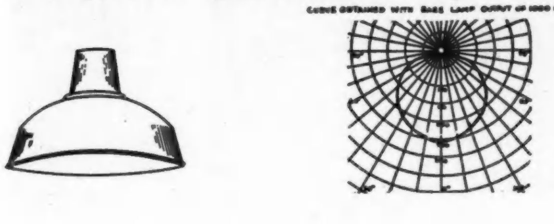
approximately 3,000 hours as against that of tungsten filament lamp 1,000-1,500 hours.

(c) The additional cost of fittings, lamps and accessories if mercury/sodium vapour or fluorescent lamps are used.

(d) Reduction in the size of electricity cables required when mercury/sodium vapour and fluorescent lamps are used.

(e) The lower brightness of mercury/sodium vapour lamps and the extremely low brightness of the fluorescent type.

CURVE OBTAINED WITH BARE LAMP OUTPUT OF 1000 LUMENS.

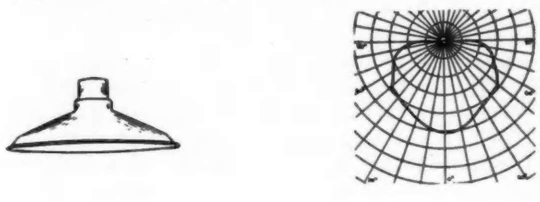


DISPERSIVE

LAMP RANGE	DIAM INCHES	SPACING RATIO
60 - 1500W GENERAL SERVICE	10-20	1½ TO 1.
80 - 400W MERCURY DISCHARGE		-

WHEN USED WITH M.E.D. REFRACTOR GLASSWARE IS PROVIDED.

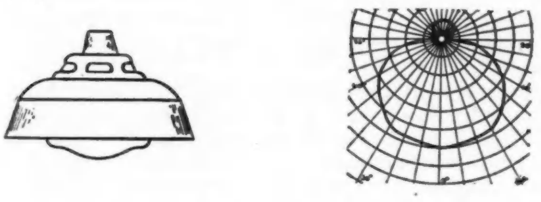
FIG 1A



DISTRIBUTING.

LAMP RANGE	DIAM INCHES	SPACING RATIO
60 - 1500W GENERAL SERVICE	10-20	1½ TO 1.
80 - 400W MERCURY DISCHARGE	15-21	2 TO 1.

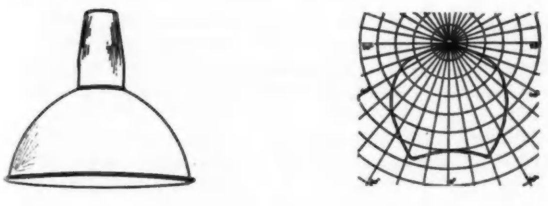
FIG 1B



INDUSTRIAL DIFFUSING UNIT (GLASSTEEL)

LAMP RANGE	DIAM INCHES	SPACING RATIO.
60-500W GENERAL SERVICE	18-20	1½ TIMES HEIGHT
80-250W MERCURY DISCHARGE		

FIG 1C



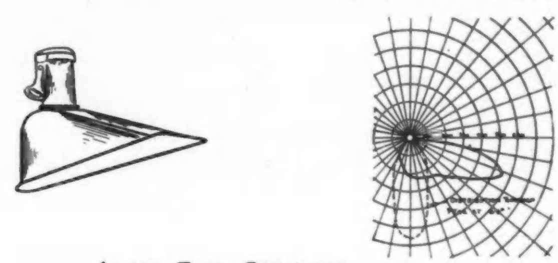
CONCENTRATING.

LAMP RANGE	DIAM INCHES	SPACING RATIO
60 - 1500W GENERAL SERVICE	9-18	1 TO 1.
80 - 125W MERCURY DISCHARGE	15	-

WHEN USED WITH M.E.D. REFRACTOR GLASSWARE IS PROVIDED

FIG 1D

CURVE OBTAINED WITH BARE LAMP OUTPUT OF 1000 LUMENS



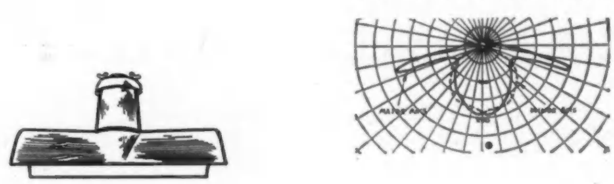
ANGLE TYPE REFLECTOR

LAMP RANGE	SPACING RATIO
300 - 1500W GENERAL SERVICE	MAJOR AXIS 3 TO 1
125 - 400W MERCURY DISCHARGE	MINOR AXIS 1 TO 1

WHEN USED WITH M.E.D. REFRACTOR GLASSWARE PROVIDED.

FIG 1E

CURVE OBTAINED WITH BARE LAMP OUTPUT OF 1000 LUMENS

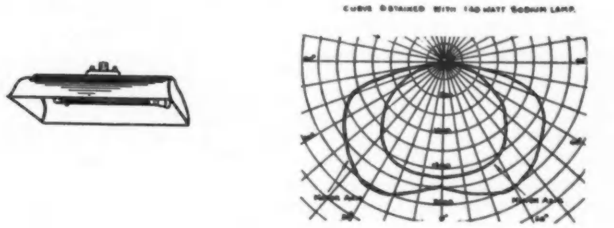


PARALLEL DISPERSIVE.

LAMP RANGE	SPACING RATIO
60 - 500 W GENERAL SERVICE	3 TO 1

FIG 1F

CURVE OBTAINED WITH 140 WATT SODIUM LAMP.



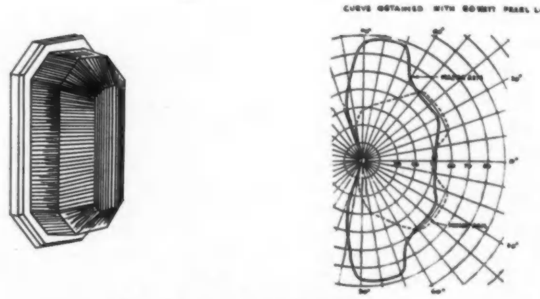
INDUSTRIAL DISPERSIVE REFLECTOR FOR SODIUM DISCHARGE LAMPS

LAMP RANGE 45 - 2×140WATTS SODIUM DISCHARGE LAMPS.

SPACING RATIO
MAJOR AXIS 2 TO 1.
MINOR AXIS 1½ TO 1.

FIG 1G

CURVE OBTAINED WITH 60 WATT PEARL LAMP



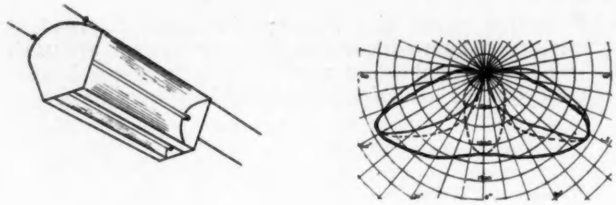
PRISMATIC DIRECTIONAL.

LAMP RANGE 40 - 100WATTS GENERAL SERVICE TUNGSTEN LAMP

SPACING RATIO
MAJOR AXIS 3 TO 1
MINOR AXIS 1½ TO 1

FIG 1H

Dock and Quayside Lighting—continued

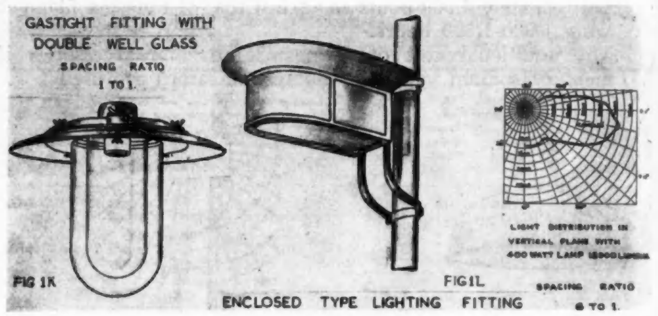


THREE LAMP FLUORESCENT LANTERN.

LAMP RANGE 3 × 80 WATTS FLUORESCENT ELECTRIC DISCHARGE LAMPS.

SPACING RATIO 3 TO 1

FIG 1J



(f) The fragility of certain discharge lamps with consequent risk of breakage, also the relatively large size of some types is also in some situations a contributing factor to breakage.

(g) The difficulty in some situations in housing the larger fitting necessitated by discharge lamps. This refers particularly to the fluorescent type.

(h) Where very even and shadowless illumination is essential the fluorescent lamp gives this requirement, probably better than any other light source.

The considerations to be taken for each section of a dock lighting installation may be briefly indicated:—

Quay, Siding and Roadway Lighting

The mercury/sodium vapour or gas-filled tungsten filament lamp may be used giving consideration to (a), (b), (c) and (d) if the distance between lamp standards is great; (e) should be given particular consideration as light sources of high brightness are apt to cause glare, and the choice will lie between a light source of high brightness (gas filled tungsten filament lamp) fitted in a refractor lantern or a source of lower brightness, say a mercury or sodium vapour lamp fitted in a less expensive reflector fitting.

Cranes, Coaling Appliances, Slipways, Graving Docks Lighting

As this usually requires projector fittings or highly concentrating fittings, the gas filled tungsten filament lamp has a great advantage on account of the concentrated nature of the light source, and in some cases the special projector lamp having a very concentrated filament is very often used.

Grain Silo Lighting

Owing to the large number of lighting points required, due to obstructions making the illumination of the area by relatively small number of high output light sources difficult or even impossible, the gas filled tungsten filament lamp has great advantages.

Warehouse Lighting

Mercury or sodium Vapour lamp where colour perception is unimportant, or the gas filled tungsten filament lamp may be used.

The fluorescent lamp whilst giving the most shadowless and even illumination suffers from the disadvantage of fragility and size, for use as a light source except under very special considerations.

Conveyor Tunnels, crane cabins, passage ways etc.

As these call for a fairly large number of well protected small candle power units, the gas filled tungsten filament lamp is the usual choice.

Electric Lighting Fittings

The light sources as indicated emit light in all directions, and also, with the exception of the fluorescent lamp are too bright to be viewed directly. It is necessary therefore to control the light emitted in order that it may be directed to where it is required, and also to reduce the brightness. This may be brought about by the use of reflectors or refractors or a combination of both incorporated in a suitable fitting or lantern, and such combinations are generally referred to as electric lighting fittings.

Reflectors

These may be designed to give specular reflection this being obtained from a smooth polished surface, and hence the reflected ray of light is not spread or scattered. These are generally used where a concentrated and intense beam of light is required as for floodlights, projector lights or concentrating fittings.

The second type of reflection is known as diffuse reflection, and is obtained when a perfectly matt surface is used as a reflector, the reflected ray being spread and scattered, thus giving maximum diffusion of the light, reducing glare and the intensity of shadows. This type of reflector is incorporated in dispersive fittings where a large degree of diffusion is required.

Spread reflection is a combination of the two and is obtained for example when an enamelled surface is used as a reflector, this type being almost invariably used for standard dispersive fittings.

Refractors

Light rays are bent when passing from one medium to another i.e. from air to glass for instance, and hence prismatic glassware is successfully employed to control the distribution of light and translucent materials such as flashed opal glass, pot opal glass and white plastic may be used to give diffusion, often in conjunction with a reflector.

From the above, it will be seen that electric lighting fittings may be divided into three general classes, namely, the reflector type, and a fitting which is a combination of the two.

The former consist of a scientifically designed reflector having an inner reflecting surface of vitreous white enamel, mirror, silver or similar plating or deposited matt finish, depending upon whether the reflector is to be used as a highly concentrating device or a dispersive type reflector.

A vitreous enamel finish is mostly used on account of durability and ease of cleaning; where mirrors, silver plating and matt finishes are used it is usual to enclose the fitting by a glass screen or screens which may be refractors or diffusers. When this latter form of construction is adopted the fitting may be regarded as a type between a reflector and a refractor.

The true refractor type is the lantern provided with glass refractor screens upon which almost full reliance is made to ensure correct light distribution.

Reflector fittings may be of the following types:—dispersive, concentrating, distributing, angle, parallel dispersive (used for illuminating long narrow areas) and the trough fitting used for fluorescent and sodium lamps and the directional prismatic.

The advantages of the reflector type of fitting are:—low first cost, robustness, ease of cleaning and maintainance. The disadvantages are whilst distribution is reasonably good, diffusion is not so good as the refractor type, hence shadows are much deeper, the lamp is visible below the reflector cut-off angle and glare is therefore a possibility.

True refractor fittings are generally of the highly dispersive type and have the advantage of giving a high degree of distribution and diffusion, thus reducing the number of lighting points, the deepness of the shadows and glare.

The disadvantages are relatively high cost, fairly high breakage risk and weight.

Reflector or refractor fittings may be used with gas-filled tungsten filament lamps, sodium vapour lamps or mercury vapour lamps, with or without a glassware diffusing skirt.

The types of fittings available are illustrated in Fig. No. 1a to 1l.

(To be continued)

The Port of Liverpool

Chairman's Report at Annual Meeting

At the annual meeting of the Mersey Docks and Harbour Board held on the 12th December last, Sir Thomas A. L. Brocklebank, Bart., the chairman, recalled that the previous year's working had resulted in a deficiency of £774,000, and that no allocations had been made to their Reserve Accounts, this result having been brought about by the abnormal conditions arising out of the transition from war to peace.

Continuing, Sir Thomas said that the year ended last July showed better results. After making reasonable, if not entirely adequate allocations to their main reserve accounts, there was a surplus of £104,000 which reduced the deficiency carried forward to £670,000, and so far the current year's operational results were sufficiently favourable to encourage the hope that they would be able to reduce the deficit again next year. But costs and expenditure generally continued to rise, and they had been forced to raise their rates and dues as from May 19th last to 85 per cent. above the schedule rates.

The number and tonnage of foreign-going ships using the docks showed an increase over last year. Compared with pre-war, imports were down and exports were up. The increase in the export trade added to the shortage of sheds due to destruction by enemy action had made is difficult to give adequate deep-water berths to all the vessels sent to the Mersey to load. That problem had been accentuated by the difficulty they had experienced in maintaining a reasonable depth of water at the Brunswick Dock river entrance. In an effort to improve that their engineer, after discussion with an eminent consultant, had started a new plan of dredging which they hoped might lead to an improvement, though it would be some little time before results could be achieved.

The Government were very anxious to improve the turn-round of vessels and the Board would continue to do everything in their power to achieve this as they were well aware how vital it was to the welfare of the nation, but they were very gravely handicapped owing to the very extensive war damage and the difficulties and delays in getting their sheds repaired and rebuilt.

Reconstruction Schemes in Hand

Every effort was being made to proceed with the reconstruction of their property and with schemes of modernisation, but they were faced with great difficulties in obtaining materials. They were, however, proceeding with various schemes which will be of benefit to the trade of the port, such as the laying out of timber grounds on the west side of Waterloo Road, at the north end of their estate.

Major reconstruction work was in progress at South Gladstone Branch Dock No. 1 and at West Alexandra Dock, and the intention is to start reconstruction at North Canada Branch Dock No. 2 and South Canada Branch Dock No. 3 as soon as possible. When these works have been completed they will provide eight additional berths and they hoped to then proceed with further reconstruction of transit sheds.

The installation of the port radar (the first of its kind in the world) was proceeding and Sir Thomas hoped it would be functioning by next summer. The new salvage and conservancy vessel ordered had been delivered and gave every sign of proving to be a most efficient and useful craft. She was probably the most up-to-date vessel of her type yet constructed. The construction of their new dredging plant had been slowed down due to the shortage of steel. While the work on the training banks in the channels was proceeding steadily and the entrances to the port continued in good condition, the accumulation of deferred dredging in the docks was being dealt with only with the assistance of outside contractors.

The financial position regarding war damage, the negotiations concerning which had been in the hands of the Dock and Harbour Authorities' Association on behalf of the ports generally, was now showing signs of clarification, and he hoped before long they would know where they stood.

"Like everyone else," Sir Thomas concluded, "we have been faced and continue to be faced with many uncertainties and difficulties, but our experience in the financial year under notice has been encouraging and enables us to look forward to the future with some confidence. We have a very good staff who have worked hard during the past year, often under rather discouraging conditions, and our thanks are due to them that we have got through a difficult year as well as we have."

Officials Re-Elected

At a subsequent weekly meeting of the Board, Sir Thomas Brocklebank was unanimously re-elected chairman, Mr. Edmund Gardner was re-elected deputy-chairman, and Mr. David Collett was nominated by the Minister of Transport to take the place of Mr. T. Stone. Messrs. A. C. Morrell, Alma Parkin and Charles McVey were reappointed Wallasey Embankment Commissioners, and the various committees of the Board, subject to minor alterations, were reconstituted as before.

New Salvage Tender

The twin-screw salvage tender, *Salvor*, already referred to, was recently delivered to the Mersey Docks and Harbour Board by her builders, Messrs. Ferguson Brothers (Port-Glasgow), Limited.

In addition to being complete with every device for salvage work, *Salvor* is also capable of dealing with dock or ship fires, laying heavy moorings and buoys, and survey work in Liverpool Bay and the Mersey. Her main dimensions are 160-ft. length, 34-ft. beam and 16-ft. 3-in. depth.

The twin fire and salvage pumps, of centrifugal "Drysdale" type, are housed on the main deck, with suctions to each side for salvage work and suctions from the sea for fire purposes. Two large fire fighting monitors are situated on the upper deck, and, in addition, there are six portable fire guns on each side on main deck bulwarks. A considerable number of fire hose connections are also ranged around each top deck monitor. Equipment is included to fight oil fires and the *Salvor* herself is protected from spread of fire inboard by drenching and spraying nozzles.

Heavy lifting derricks are provided for buoyage operations and there are two Clarke Chapman electrically operated capstans and a heavy steam winch forward. The bow is specially designed with a substantial cast steel rubbing piece to take a 100 ton lift.

There are two 290 k.w. Paxman-Allen diesel generators supplying power to the electric capstans, salvage pumps, etc. An auxiliary diesel generator and steam generator are also installed.

The main propelling room contains the twin screw triple expansion engines of Messrs. Ferguson Brothers' manufacture, capable of a combined total indicated horse power of 1,450, and there is a range of modern auxiliary machinery. Steam is supplied by two marine return tube boilers burning oil on the Howden Wallsend system.

Navigational aids include the latest bridge pattern C.M.R. Radar Instrument, having a revolving scanner on the mast truck and its motor generator in the forehold. Other aids include echo sounding, searchlight and Marconi type radio telephone installation.

Spacious accommodation is provided for surveying staff, ships' officers and crew. There is additional accommodation for wreck raising party.

PORT OPERATION

Part 13 of a Series of articles by A. H. J. BOWN, M.Inst.T., A.C.I.S., and Lt.-Col. C. A. DOVE, M.B.E., M.Inst.T.

(Continued from page 210)

Cargo Handling 5 (D)

Office Control, Commercial, Financial and Administrative Routine Involved

The office control of cargo handling is not confined to the traffic office of the port authority itself, but, for students of port operation, it is the chief nerve centre of the system. When a ship arrives in a port and there discharges or loads a cargo, practically everything that happens to the cargo in the port area is either directed by or recorded in the traffic office. For this reason, the paragraphs which immediately follow, describe the traffic office control of an inward vessel discharging a mixed general cargo, in terms of one system familiar to the authors. This system is believed to be fairly typical. At the port in question, the ship sometimes engages its own labour for the inboard work and the port authority is responsible for the remainder of the cargo handling; in other cases, the port authority undertakes all the labourage. Discharge is normally by quay cranes owned and operated by the port authority, but ship's gear is also sometimes employed (e.g., overside to craft, for heavy lifts, and occasionally to supplement quay cranes). The port authority operates its own railway system between the ship's side and the exchange sidings.

The First News

The earliest notification of the vessel's impending arrival is usually by letter sent from the local office of a firm of steamship agents to the Traffic Manager. Sometimes the letter is sent to the Head Office of the port authority, in which case it is immediately transmitted, in original or copy, to the Traffic Manager. The letter gives the name of the vessel, says where she is loading or will load, indicates the general nature and total amount of her cargo and gives an estimate of her probable date of arrival. Notice may be long or short, varying from a few weeks to a few hours—the principal determining factor being the length of the voyage. Liners are more predictable than tramps; and the matter is also affected by the settled or unsettled state of world trade, or of the particular home port's connections.

The Ship's Manifest

The manifest is usually the next document to reach the Traffic Manager. It often consists of a number of sheets of considerable size. It is a complete summary of all the goods that have been loaded into the vessel now expected. It gives details of every consignment—the shipper's name, the number of packages, the nature of the goods, the marks (which have been stencilled, painted or branded on the packages), the weight of each parcel, the port of loading, the port of discharge and the consignee's name, if known. The consignee's name on the manifest is for information only so far as the Traffic Manager is concerned. It is not a delivery instruction and he must not treat it as such. A manifest will have been made out in the steamship company's office (or their agents' office) at each loading port and despatched to the agents on the discharging side by mail steamer or air mail, in advance of the cargo vessel. The agents send one or more copies to the port authority. Thus, the Traffic Manager is enabled, some time before the vessel arrives, to size up the job which is coming along and to make the best arrangements to deal with it.

The manifest is sent by the Traffic Manager to the appropriate Department of his Office. At the port now being considered, the following Departments are housed in the main Traffic Office:—(1) General Goods Department; (2) Grain Department; (3) Timber Department; (4) Warehouse Department; (5) Railway Department; (6) Ship's Charges Department; and (7) Statistical Department.

THE DEEFORD STEAM SHIPPING COMPANY LIMITED

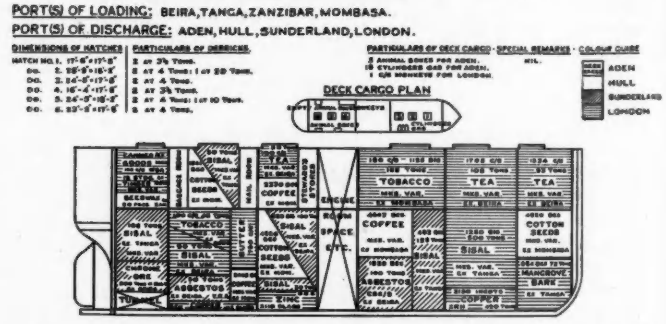
Manifest of the S.S. "DEEPWELL" from Kotka to Sunderland the 30th November 1947

B/L No.	Shipper	Marks & Numbers	Description	Consignee	Weight	Rate of Freight	Freight paid	Freight forward	Through-freight to:	Remarks
					Tons					
1	Prestwood	PD 253/1.	193 bales	The Rapid	32.98					
	Company	809/1001	Finnish Birch	Tea Packers						
			Plywood	Limited						
2	Yarewood	YC 193/2.	100 bales	Seat	25.00					
	Company	1/100	Chair parts	Assemblers						
				Limited						
3	Flatpress	FD- 3-22.	108 bdls.	Upright Chair	10.16					
	Limited	123/230	Plywood	Company						
			Chair seats							

The manifest, in the present case, having been received in the General Goods Department, is multi-copied, so that all those who will be concerned with the discharge of the cargo—in the Traffic Office, at the Section Office and in the Shed Office—may be supplied with a working copy.

The Stowage Plan

The stowage plan, also made out on the loading side and despatched with the manifest, is usually supplied to the Traffic Manager with that document. It takes the form of a diagrammatic, longitudinal section of the ship and shows in what holds



and at what levels the various consignments will be found. Its great value at the discharging port will be readily appreciated, especially when it is supplied for preliminary study, well in advance of the ship's arrival.

Ship's Releases

A number of ship's releases must be received by the Traffic Manager in respect of every inward cargo. A ship's release is addressed to the port authority and is signed on behalf of the steamship company or their authorised local agents. It authorises the port authority to deliver certain goods to the order of a named person or firm. The ship's release is very often called a delivery order, or D/O, but it must on no account be confused with the forwarding order or forwarding instructions, to which reference is made below. The ship's release does not tell the Traffic Manager what to do with the goods: it gives him authority to accept in-

Port Operation—*continued*

structions in regard to them from the person or firm named on the release.

The Traffic Manager should expect to receive ship's releases to cover every item manifested for discharge at his port. If all the cargo is not thus released, he must hold the unreleased balance to the order of the steamship company or their agents.

The receipt of the ship's release is all-important to the Traffic Manager and he is not personally concerned with the transactions which have preceded its issue. In practice, however, he knows that the holder of the bill of lading will have lodged that document with the steamship company's agents and obtained the ship's release in exchange. In some cases, too—but not necessarily in all—freight will have been paid; the port authority's statutory dues on the goods will have been paid; Customs entry passed; and duty, if any, will also have been paid (unless the goods are to be bonded—for which, see the special reference below).

Forwarding Orders or Disposal Instructions

These will be received by the Traffic Manager in respect of all cargo that has been released. If he receives them before the release, he cannot honour them until the release arrives. The forwarding orders are sent to him by the persons or firms to whom goods have been released; if the shipping company does not release certain goods, then the company itself may give forwarding instructions in respect of those goods and the Traffic Manager will carry out those instructions.

Forwarding or disposal instructions may include (a) orders to send certain goods away by rail, (b) or by road vehicles, or (c) by coastwise vessels or lighters, or (d) to remove goods from the transit shed to the warehouse.

At the port under consideration, a very useful style of forwarding order was evolved (and supplied to regular traders) as the result of experience over many years. The form is in quadruplicate, folded for use with carbon paper, and consists of (1) forwarding order, (2) advice note, (3) railway consignment note, and (4) merchant's office copy.

The forwarding order (with advice note and consignment note attached) is addressed by the merchant to the port authority and orders them to deliver a certain number of goods ex a named vessel, and bearing certain marks, by a particular means of transport to a consignee of such-and-such a name at a given address.

The advice note bears the same particulars and also shows the date of execution of the order—that is, so far as the port authority is concerned. The advice note is sent to the merchant by the port authority by post on the day the goods are handed to the carriers.

The railway consignment note is handed to the railway company named upon it by the Traffic Manager's outside department, when the wagons containing the goods are handed over to the company.

The merchant's office copy is retained by him throughout for record purposes and for following-up any queries or alleged delays.

Transfers or Transfer Orders

An import merchant having goods due to arrive for him by a certain vessel, or lying at docks awaiting his orders, may not wish to have them sent away or warehoused. He may sell them—in whole or in part—where they lie. In that event, the Traffic Manager will receive from him a transfer, or transfer order, and a record will be made (see below for details) of the particulars of the transaction as set out on the transfer order.

The Order Book

Documents relating to the working of the cargo will be recorded primarily in two books in the General Goods Department. They are the Order Book and the Ledger. There is only one Order Book for the whole General Goods Department, but the number of Ledgers has no necessary limit. The Order Book is kept at the Order Desk, where it is written up by a team of clerks, who work in shifts so that work may proceed at this Desk both early and late. The early work is necessary in order that the day's orders may be entered in the Order Book as soon as they are received from the inward mail department and before the ledger clerks arrive. The late work is necessary because it is convenient that the work of advising should also be done from the Order Desk, and advice notes cannot be despatched until the forwarding orders, having been executed, are brought back from the sheds.

Every ship's release, forwarding order, warehousing order and transfer is date-stamped, serially numbered, and entered into the Order Book as soon at it is received. The documents are not separated as to kind, but are numbered as one series. The particulars entered are number, date of receipt, ship's name, merchant's name, number of packages, nature of the goods, consignee's name and address, and there is a final column for date of execution.

The Ship's Ledger

The traffic office ship's ledger is not a ledger at all in the accountant's sense—that is, it is not a record of financial debits and credits. The traffic office ledger keeper is the key man of the ship's discharge. He sits, as it were, at the junction of two fans. One fan radiates out by telephone, telegram and the ordinary post to all the merchants interested in his cargo. The other fan radiates out to all the outside departments on the dock which are associated with the discharge and handling of his cargo. If he has, outside, a good section superintendent and a competent shed foreman, his life will be easier. He must work fast, scamp nothing, keep calm under pressure and be capable of dealing with a number of people at once.

He will normally be looking after several cargoes at the same time. He may be clearing up one, have a second in the full tempo of mid-discharge, and be " opening a ledger " for a third not yet arrived.

In these days his ledger is a loose-leaf affair and, before his vessel arrives, he will have prepared his ledger sheets as far as he can. He will have read any preliminary correspondence and, when allocating the ship to him, the Head Clerk of the Department will have handed him the manifest, together with any ship's releases or forwarding instructions already to hand.

The columns on the left-hand page of the ledger relate to the goods themselves; the right-hand page is ruled for entries relating to charges against the goods. The safest rule is " one page per parcel," but in simple cases, requiring but little detail, this rule is relaxed to save paper. Every page must be inscribed at the top with the name of the ship, her rotation number and date of arrival. To this is later added the date of completing discharge and the date when rent on the goods must commence. The rotation number is the serial number taken from a book in which particulars of every vessel entering or leaving the port are set down in order of date. The careful and regular use of the rotation number reduces the risk of mixing two different cargoes brought by the same ship but on different voyages.

On each left-hand page, the particulars taken from one ship's release are first set down. These are: (1) the date and number of the release; (2) the name and address of the person or firm named on the release, i.e., the proprietor of the goods; (3) the description of the goods; (4) the number of packages of each mark, with particulars of the mark itself, in every case.

These quantities, taken from the release, are the bill-of-lading quantities. The actual out-turn quantities, mark by mark, will probably not agree, in all cases, with the bill-of-lading quantities. This point will be referred to again. Columns are provided for the out-turn particulars—number of packages, shortages, overages, damaged, slack, ullaged, re-coopered, and the like.

The entry of the release particulars, and the columns for the out-turn, occupy only the left-hand portion of the left-hand page. The main part of the page is divided into columns (including one for every mark) wherein to record the receipt and execution of every forwarding order. The details entered are the date of receipt, number of the order, consignee's name and address, description of the goods, the number of the packages, the marks, the mode of transport and the date of execution.

Port Operation—*continued*

The Routine

In addition to recording such documents as have already been lodged, the ledger clerk will be anxious to get reliable information regarding his ship when she is about 24 hours "off." He may have a number of forwarding orders in his hands in respect of which the merchants concerned may be expecting to be charged the lowest operating rate—namely, the rate for direct delivery ex ship to railway wagons, or ex ship to craft overside; and he may know, from the stowage plan, that the goods in question are "top-stowage" and likely to begin to come ashore shortly after the ship berths. He will be wanting to warn those responsible to requisition and place an appropriate number of empty wagons, or to take any steps they can to arrange for lighters to be in position.

As much in advance of actual berthing as possible, he will ascertain the berth which has been allocated to his ship, and will at once send out a copy of the manifest, a copy of the stowage plan, and all available forwarding orders to the Shed Office. The Section Superintendent, in whose Section the berth lies, will also make an opportunity, before the actual tide of arrival, to call at the Traffic Office to discuss the ship, cargo and berth with the ledger clerk. These two will maintain close liaison throughout the discharge.

The forwarding orders sent out to the shed before the ship's arrival will, as described above, have been entered in the Order Book and in the ship's ledger. The entry in the ledger will be in ink, except the number of packages, which will be in pencil. The pencil figure will later be replaced by ink—and if the out-turn does not agree with the bill-of-lading, the ink figure against some orders will differ from the original pencil entry.

Transfers are retained in the Traffic Office and not sent out to the Shed. In the ledger, they are entered in red ink against the release holder's stock and carried over to a fresh page, where an account is opened in the name of the transferee.

The ship arrives, is berthed, is supplied with cranes, is manned up, and the empty wagons, road vehicles and barges have been placed in readiness. Discharge of the cargo commences and deliveries are made, as rapidly as possible, in accordance with such forwarding orders as the Shed Foreman may have in his possession. The detailed process of discharge goes forward as described in previous chapters.

By every post, fresh batches of releases, transfers and forwarding orders arrive at the Traffic Office. They are put through the Order Book and the Ledger, as previously described. At frequent intervals, the orders are collected by messengers and taken out to the Shed Office.

Every time a messenger returns, he brings back with him all orders that have been completed. The detailed tallies, against each mark, have been indicated by the checker on the face of the order (when the number of packages is small) or on separate tally sheets (when the order is a large one). When an order is very large, so that only a part may be delivered in one day, tally sheets are sent to the office day by day, until eventually the completed order itself can be sent in, with all the daily deliveries marked on the back and brought to a total.

A tally sheet for road or rail delivery should never be accepted as complete unless it shows, in addition to the stroke tallies of every mark, details of the wagon or lorry stowage brought to a total agreeing with the stroke tally total. The completed orders or part-orders are all "marked off" in the Ledger and in the Order Book.

When the cargo is all out of the ship, the ledger clerk and section superintendent must decide together upon the earliest convenient moment for the undelivered balance of the cargo to be "taken up." The object is to determine the exact out-turn. Orders resting at the Shed must all be worked away and the completed order forms sent back to the Office. No fresh orders are sent out for the time being. The take-up book is sent out instead, and in it must be entered a complete, detailed record of the cargo remaining in the transit shed. The book is sent back to the ledger clerk and he immediately resumes the sending out of fresh orders.

He totals all the deliveries in his ledger and summarises them under marks and commodities. To these totals he adds the totals from the "take-up" book, and thus arrives at the out-turn of the cargo.

Landing Accounts

The ledger clerk's next duty is to send to every proprietor a Landing Account, showing how the parcel of goods released to him actually turned out of the ship. This document will show whether the out-turn was in accordance with the bill-of-lading or not. The marks will be separately indicated, and shortages, damages, ullages and slacks will all be shown.

Freight Book

This is a summary of all the landing accounts and it is prepared by the ledger clerk and rendered to the steamship company or their agents. If any merchant's parcel is short or defective in any respect, he will claim on the shipping company and will produce his landing account in support. The shipping company will check the landing account, thus produced, against the freight book.

Charges

The ledger clerk must now make out for every merchant an account for "receiving and delivering" his parcel. Under the normal B/L terms, it is the merchant's duty to accept his goods from the ship at the ship's rail and take them away. Instead, the port authority has "received" them at the ship's rail on the merchant's behalf and "delivered" them to rail, road, craft or warehouse. Under the system we are considering, the ledger clerk makes out the accounts in duplicate, enters particulars of each in his ledger against the parcel, has them checked, and despatches them—still in duplicate—to the Chief Accountant's Department at the Head Office of the Undertaking.

The tariff for "receiving and delivering" general cargo contains the following different sorts of charge, usually levied at a rate per ton:—

(1) Receiving and delivering direct overside to craft;

(2) Receiving and delivering direct ex ship to railway wagons or to road vehicles (orders to be received before the ship's arrival);

(3) Quay rate: Applied to goods for which orders are received within 72 hours of the ship's arrival;

(4) Warehouse rate: Applied to goods for which orders are *not* received within 72 hours of the ship's arrival.

The level of the charges mentioned above rises progressively from (1) to (4). The "direct overside to craft" work is done by ship's gear and the port authority's duties are light. The "direct ex ship to rail or road" service is valuable for rapid and cheap despatch, but it cannot be done if careful sorting to mark, or weighing, or elaborate sampling or Customs examination are required, and it is very dependent on a good truck supply and convenient stowage. The history of the quay rate and the warehouse rate is peculiar. Originally, the time element was not material: the quay rate was allowed on all goods which did not undergo physical transfer from the transit shed to the warehouse, and such transfer was always delayed as long as possible, e.g., until the transit shed had to be cleared for more traffic. But the merchants complained that, under this system, they could never be certain what the dock charges were going to be, and they wished to to be certain so that they might invoice correctly. Therefore they asked for a time limit to be introduced as the deciding factor. Under the revised system, the warehouse rate is charged on some goods which never leave the transit shed until they are delivered. The merchants occasionally object to this. It is difficult for a port authority to please everybody.

Rent

Warehouse rent can never arise except on goods which have incurred the warehouse rate. Rent is incurred on such goods from the mean date of the ship's discharge plus 3 days of grace. At some ports a longer free period is granted. The basis of the

Port Operation—*continued*

charge is so much per ton per week or part thereof, three days or less being charged as half a week. The ledger clerk must take care to add the proper charge for rent, if any has been incurred, when he is making out the account for "receiving and delivering."

Extra Operations

He must also watch the left-hand pages, as he goes through making out the bills, in order to charge for any extra services which a merchant may have asked for or incurred. These may include:—

(1) Weighing goods, over the scale, on delivery, and rendering the weight notes with the forwarding advice.

(2) Weighing goods in truck-loads (e.g., ore in bulk, esparto, concentrates) on delivery, and rendering the weighbridge certificate.

(3) Attending on H.M. Customs, opening and closing cases for examination.

(4) Re-coopering damaged cases, sewing-up damaged bag cargo.

(5) Shooting dirty bagged cargo into clean bags.

(6) Averaging or net weighing, i.e., opening a percentage of cases of each mark, weighing the contents, repacking and closing, and rendering a certificate.

There are many more of such possible extra operations and it is important that the ledger clerk should note each of them, at the time of ordering, on the left-hand side of his ledger. The work covered by the ordinary quay rate is landing by crane from over ship's rail to shed, sorting to mark, stacking back, redelivering ex stack and loading to rail, road or craft (including stowing of rail wagons but not road vehicles or craft), tallying out and haulage of loaded wagons to exchange sidings. The warehouse rate covers in addition the intermediate operation of removing the goods from the transit shed to warehouse and stacking therein, ultimate re-delivering being included as with the quay rate.

The Official Return

For record and statistical purposes, the ledger clerk completes his task by preparing, in triplicate, an official return of the cargo. He sends one copy to the Chief Accountant at the Head Office of the port authority, passes the second copy to the statistical department of the Traffic Office, and retains the third copy for filing and future reference in his own department. The Return gives summarised particulars of the vessel and the out-turn of the cargo and shows in particular how much cargo was charged at each rate. The total sum arrived at in this way should agree with the actual total of the bills rendered, which is also declared on the Return together with the number of bills made out.

Continuing Rent

The ledger clerk will keep the ledger sheets relating to the vessel in his "live" file until the last package has been delivered and marked off, and the last monthly account for rent incurred has been rendered. He finally rules off each "release" sheet as the last of the parcel is delivered; and he does the same on the opposite side when he is finally satisfied that the last account for rent has been rendered. The ledger sheets may then go to the "dead" file, but they will be called for, from time to time, in connection with internal audit and also, in view of their great value as records, they are liable to be wanted for other purposes and are therefore preserved for a term of years.

Charges Against the Importer

It will have been seen from the foregoing that the import merchant is liable to pay to the port authority (1) statutory dues on the goods; (2) charges for receiving and delivering; (3) charges for extra operations, e.g., weighing, sampling, re-coopering; and (4) rent, if incurred.

At many U.K. ports, dues on goods are collected under two heads—a port (or river) due, and a dock (or quay) rate. A ton of goods brought into the port or river and thence into a dock and there landed, pays the port due and the dock rate. A ton of goods brought into the port or river and landed at a public river quay, pays the port due and the quay rate. Port dues, dock rates and quay rates are all charges for the use of facilities that have been provided and must be regularly maintained if they are to be always available to importers. Lighthouses, protecting piers, dredged channels, dock entrances and piled quays all cost great sums to provide and require heavy expenditure to maintain. The dues on goods paid by importers help to provide the revenue which the port authority requires in order to pay (a) annual interest on the original moneys borrowed to construct or purchase the facilities, (2) sinking fund charges towards the redemption of such borrowings, (3) the expense of regular maintenance and (4) the administration of the undertaking. Dues do not relate to work done or to operations performed upon the goods; the proper charges for these services are the labourage rates which have been mentioned above.

The level of dues on goods chargeable by U.K. port authorities ranges from a fraction of a penny to several shillings per ton—depending mainly upon the value of the commodity. A schedule of maximum charging powers is commonly incorporated in the authority's private Act of Parliament. Provision for commodities not specifically mentioned is usually made by means of a "reasonable charges" clause.

Some port authorities have a full-time Dues Collector with special staff and offices. In such cases, he is often responsible for the collection of tonnage dues (i.e., dues on vessels) as well as dues on goods. The office of Dues Collector is sometimes held by the Secretary or Clerk, or by the General Manager, or by the Traffic Manager, or by one of their chief assistants. The dues are paid by the import merchant or his forwarding agent at the head office of the authority or at the traffic manager's office: practice varies. The time of payment is the time of landing of the goods, or thereabouts.

Frequently, the port authority and H.M. Customs have a working arrangement regarding the payment of dues whereby no Customs entry for goods is allowed to go to the Customs officer at the ship's berth until the document has been stamped to indicate that the port authority's dues have been paid. In some cases, the authority's dues collector has an assistant of his own permanently posted and working daily with H.M. Customs indoor staff at the Customs Office.

Charges Against the Ship

A ship arriving at a port to discharge or to take up cargo or both (with or without passengers in addition) will require many facilities and services. As has been pointed out in an earlier chapter, the general tendency is for the port authority to provide the static facilities whilst various private firms supply the services. But practice varies very considerably—one factor being the natural anxiety of port authorities to maintain sufficient control to keep ship's expenses down to reasonable levels. The following list of possible payments by a cargo ship might arise at one U.K. port known to the authors:—

(1) **To the port authority.**

Port dues on the vessel's net register tonnage.
Lighthouse dues on the vessel's net register tonnage.
Pier dues on the vessel's net register tonnage.
Dock rates on the vessel's net register tonnage.
Watermen's rate on the vessel's net register tonnage.
Stevedoring charges (including hire of quay cranes) for discharging cargo.
Charges for fresh water supplied from water-boats or shore hydrants.
Dry dock dues (unless a private dock were used).

(2) **To other bodies or firms.**

Pilotage fees, in and/or out, to the port Pilotage Authority.
Towage charges, in and/or out, to a firm of tug owners.
Boatage charges, to licensed boatmen handling ropes on and off moorings.
Price of bunker coal or other fuel, to bunkering agents.

Port Operation—*continued*

Price of ship's stores taken aboard, to chandlers.
Cost of repairs in port, to a ship-repairing firm.
Dry dock charges (unless a public dock were used), to the dock owners.
Light dues, to H.M. Customs for Trinity House.
Police dues, to the port Police Authority.
Agency fee, to the agents making disbursements and looking after the ship in port.

The charges under (1) above would be collected by the port authority in the following manner. The ship's agent would call at the Dues Office (shortly after the ship's berthing and pay the port, lighthouse, and pier dues, and also the dock rate and the watermen's rate. At the port under consideration, the last-named item is a small charge levied on the vessel's n.r.t. to cover the services of attendants supplied by the port authority to give assistance to masters in moving ships within the authority's docks. The Traffic Manager would render a bill for the stevedoring charges to the ship's agent. The charges would be based upon contract rates previously or specially agreed between the agent and the traffic manager. The charge for fresh water would be at the port tariff rate per 1,000 gallons and would be based on a delivery note, prepared by the authority's water boatmen, signed by the ship's officer and passed through the Traffic Office to the Dues Collector who would collect the money from the ship's agent. Dry dock dues would be collected from the firm of ship repairers who hired the dock and it would be their business to recover from the ship.

Official Control of Outward Cargo

Correspondence between a shipowner (or his agent) and the port authority's traffic manager usually precedes the fixing of a vessel to load outwards: sometimes, however, cargo addressed to a particular vessel begins to arrive by rail, road or lighter before the fixture has been officially arranged. Such cargo would be off-loaded and tallied into a suitable export transit shed.

A shipping advice is sent by the ship's agent to the traffic manager as soon as he learns of any parcel about to come forward from an inland point for shipment. The fullest possible particulars are given but the shipping advice is not an order to ship the goods.

The order to ship is given in the shipping note. The ship's agent sends this document to the traffic manager when he has satisfied himself on behalf of his owners that the business is in order.

Meantime, the consignor (or a local forwarding agent acting on his behalf) has cleared the goods with H.M. Customs and they will have instructed their officers at the berth that the goods may go aboard when the ship berths. If they are not satisfied they will hold the goods in the transit shed until their requirements have been complied with.

The consignor's local forwarding agent may be a special department of the ship agent's office: or it may be the forwarding department of the company owning the vessel.

The accumulation of the cargo, prior to shipment, in the transit shed, has been dealt with in an earlier chapter. The first version of the stowage plan and the first rough draught of the loading manifest are also supplied to the traffic manager by the ship's agent as soon as ever possible.

When the ship arrives, the physical work of loading ex shed or direct ex trucks, ex lorries or ex lighters, goes forward as previously described.

The traffic office ledger clerk keeps in constant touch with the ship's agent and with his own outside department at the berth. He enters every shipping advice on a separate left-hand page of his ledger and then files the advice note pending the arrival of the shipping note. When the shipping note is received he passes it through his ledger and then sends it out to the berth. This gives the outside department their authority to load the goods and, provided they are released by the Customs Officer at the berth, they can now be put aboard.

In passing the goods up to the ship's rail, the port authority is acting for the shipper: in stowing them in the hold or on the deck, the port authority is acting for the ship. The port authority, in its capacity as shipper's agent, tallies the cargo across the quay, and obtains a mate's receipt for each shipper's parcel. Commonly, the shipping company provides an independent tally inboard, for protection of its own interests. The "mate's receipts" are forwarded to the individual shippers or their appointed forwarding agents who lodge them with the shipping company in exchange for the bill of lading. The bill of lading is the receipt for the goods, the symbol of the goods at sea, the document of title and a quasi-negotiable instrument.

The master, the ship's agent, the traffic office ledger clerk and the loading foreman maintain constant touch as the loading draws to an end and all the parcels on the draft manifest (or engagement list) are accounted for and put aboard. The actual finishing time is then agreed and the ledger clerk hands the draft manifest (amended and/or extended as may have proved necessary) to the ship's agent, together with the completed draft stowage plan.

Outward dues will normally have been paid by the forwarding agent at the time of passing the Customs entry for the goods. The ledger clerk then goes through his ledger making out and despatching shippers' accounts for "receiving and loading to ship's rail," extra operations, if any, and shed rent. As port authorities like export cargo to arrive early, the "free-rent" period for export cargo is usually lengthy—sometimes as much as 21 days. An account will also now be sent to the ship's agent containing the port authority's charges for stowing the cargo on board and also charges for any other work done for the ship by the port authority.

(To be continued)

Clyde Lighthouses Trust

At the annual general meeting of the Clyde Lighthouses Trust held in Glasgow early last month, Mr. George A. Workman was re-elected chairman and Lieut.-Col. Hugh Campbell, deputy-chairman for the ensuing year.

Reviewing the finances and work done during the past year, Mr. Workman said that revenue for the year was £17,815, an increase over the previous year of £4,505. After providing £1,000 for replacement of the steamer Torch, and £4,600 for dredging and maintenance of the channel against nil for last year, the revenue fell short of expenditure by £6,492, and this sum has been met out of general reserve.

The tonnage of shipping on which dues were paid for the past year was 7,273,335, an increase of 793,751 tons compared with the previous year. The total increase in revenue from rates on shipping was £5,132, the Glasgow collections accounted for £4,600, Bowling £427, and Greenock £107, while Renfrew showed a decrease of £3. Expenditure charged to revenue was £24,307, being an increase of £3,803 7s. 5d. The total of the special reserve accounts was £46,818, a reduction from the previous year of £8,478 17s. 0d.

During the year, Gantocks Beacon was electrified at a cost of £986, and four buoys were purchased from the Admiralty at £75.

All reports intimate that the new light is a success and a help to navigation.

Certain difficulties had arisen in connection with the supply and use of propane gas. This was a by-product of industry, and its production might be interfered with by the industrial crisis. In view of the possible shortage of cylinders for this gas, the trustees were making experiments by filling the buoy itself with propane gas. These experiments were still continuing.

At long last the trustees had settled with the War Department, and obtained from them the cost of the removal of obstructions at Cloch. The contract had been entered into for their removal, and work had been all but completed without cost to the trustees.

The revenue of the trust and the current expenditure were being carefully watched by the trustees, and it might be necessary during the present year to make an approach with a view to obtaining an increase in rates.

The report and accounts were unanimously approved.

Docks and Inland Waterways Executive

To Advise Transport Commission on Port Organisation and Grouping Schemes

At a Press Conference held at the Headquarters of the British Transport Commission on 22nd December last, Sir Cyril Hurcomb, G.C.B., K.B.E., the Chairman of the Commission, announced that the terms of the scheme of delegation to the Dock and Inland Waterways Executive under the provisions of Section 5 of the Transport Act have been agreed. The scheme in its present form, Sir Cyril said, applies to the activities carried on by the Canal and Inland Waterways Undertakings specified in Part II of the Third Schedule to the Act, i.e., the Nationalised Canal and Inland Navigation Undertakings other than those at the present time owned by the Main Line Railway Companies. By the Scheme, the Commission delegate to the Docks and Inland Waterways Executive all the rights, powers and liabilities of the Commission in connection with the carrying on of these Undertakings, and the Executive will as from 1st January, 1948, become the employers of the officers and staff of these Undertakings, and will manage, operate and maintain them on behalf of the Commission. The general conditions to which the Delegation is subject are similar to those in the Scheme of Delegation to the Railway Executive, recently published, and contain provisions which will enable the scope of the activities delegated to the Docks and Inland Waterways Executive to be enlarged at a later date.

It is, in fact, intended to transfer at the earliest practicable date the Railway-owned canals, which are at present included in the activities delegated to the Railway Executive, to the Docks and Inland Waterways Executive, and the steps which will enable this transfer to be effected smoothly are already under examination. It is necessary to give due consideration to the position of the staff involved, and to the organisation which will be necessary on both the maintenance and commercial sides of the undertaking. The process of the transfer must be a gradual one, but will be carried through as quickly as possible, and, pending the issue of a further Scheme of Delegation, arrangements will be made, in suitable cases, for the Docks and Inland Waterways Executive to act as agents for the Railway Executive where certain activities of the railway-owned canals can be suitably combined with those of the other Inland Waterways which will vest in the British Transport Commission on the 1st of January, next.

The Commission have also invited the Executive to advise them as to the desirability or otherwise of exercising the powers conferred on the Commission in relation to the licensing of canal carriers under Section 35 of the Act, the acquisition of such undertakings under Section 36, and the abandonment of canals under Section 37.

Transfer of Docks

The Commission have come to the conclusion that as a matter of general policy the management of the trade harbours at present owned by the Railway Companies shall be transferred from the Railway Executive to the Docks and Inland Waterways Executive, as soon as it is practicable to make the necessary arrangements, but that it will be advisable, in most cases, to except from such transfer those harbours which are mainly inter-change points between the Railways and Railway-owned steamer services. A scheme for the separation of the Railway-owned docks from the Railway systems proper is being worked out in detail between the two Executives.

In the meantime, the Docks and Inland Waterways Executive will be consulted by the Commission in matters relating to trade harbours and port facilities, and in all important questions in regard to the Railway-owned docks. The Executive are expressly charged by a special provision in the Scheme of Delegation with the responsibility of keeping the trade harbours under review, in order that they may in due course advise the Commission as to the exercise of the Commission's powers under Section 66 of the Act with regard to the future preparation of Schemes in the organisation and grouping of the port facilities of the country. This is an important function, but the ultimate responsibility for the preparation of any schemes under this Section will remain with the Commission.

The Executive, which will be collectively responsible to the Transport Commission, is so composed as to include wide knowledge and experience of the administration, management and operation of Docks and Inland Waterways, and within the organisation of the Executive itself, the full-time members will be responsible for particular aspects of the Executive's work under a functional distribution of duties. The organisation at Headquarters, which will not be large, is planned with a view to the importance of affording a wide measure of decentralisation and scope for and encouragement of local initiative.

In addition to the management of the Undertakings vested in the Commission, the Executive will have advisory functions, particularly in regard to port facilities and the review of trade harbours and formulation of proposals for their re-organisation. In dealing with these problems, with their important bearing upon British overseas and coasting trades, the Executive will consult the port authorities, shipowners, importers and exporters and the National Joint Councils of the Port and Canal Industries and the National Dock Labour Board.

Organisation of Inland Waterways

As a transitional measure, the Canals and Inland Waterways mentioned in Part II of the Third Schedule to the Act will be organised in five areas, each under the direction of an Area Waterways Manager, as follows:

Northern Area: Aire & Calder Navigation, Calder & Hebble Navigation, Leeds & Liverpool Canal, Sheffield & South Yorkshire Navigation. The Area Waterways Manager will be Mr. H. B. Emley (Aire & Calder Navigation) with Headquarters at Leeds.

North-Western Area: Weaver Navigation. The Area Waterways Manager will be Mr. C. M. Marsh (Weaver Navigation) with Headquarters at Northwich.

Eastern Area: Trent Navigation and the Nottingham Corporation portion of the Trent Navigation. The Area Waterways Manager will be Mr. J. T. Evans (Trent Navigation, with Headquarters at Nottingham.

Western Area: Sharpness & Gloucester Ship Canal, Sharpness Docks, Gloucester Docks, Severn Navigation, Worcestershire & Birmingham Canal, Staffordshire & Worcestershire Canal, Birmingham Canal Navigations, Stourbridge Canal, Gloucester & Hereford Canal. The Area Waterways Manager will be Mr. A. C. Lisle (Sharpness Docks and Gloucester & Birmingham Navigation Company) with Heaquarters at Gloucester.

Southern Area: Grand Union Canal, Oxford Canal, Coventry Canal. The Area Waterways Manager with Mr. C. Saywood (Grand Union Canal Company) with Headquarters in London.

In accordance with the provisions of Section 118 of the Transport Act, the Lee Navigation will, until a day to be appointed, be administered by the Lee Catchment Board as agents for the Executive.

In Scotland the Caledonian and Crinan Canals, at present vested in the Minister of Transport, will be transferred to the Commission on a date to be appointed by the Minister.

Each Area Waterways Manager will be responsible to the Executive for the co-ordination of operations and maintenance of the undertakings placed under him as a Group. He will carry out the instructions issued to him from time to time by the Executive and will, as necessary, transmit these instructions to the managements of the undertakings comprised in the Group. Subject to this, the Managers and staff of the transferred undertakings will carry on the day-to-day businesses of these undertakings in the ordinary course. On any matter as to which they would in the past have reported to their former Boards, they will in future report to the Area Waterways Manager, and in turn he will, wherever necessary, obtain the instructions of the Executive. The Scheme is to be regarded as provisional and the appointments of Area Waterways Managers will be made on an acting basis only for the time being.

Consideration will be given in due course to the future constitution and machinery of the National and Regional Joint Councils of the Canal and Canal Carrying Industry after discussions with the appropriate Trades Unions and Employer Organisations.

H.M. Dockyard, Devonport

Widening of No. 10 Dock*

By DONALD HAMISH LITTLE, B.Sc., A.M.I.C.E.

DISCUSSION *(continued from page 216)*

Mr. J. M. P. Hooley observed that he presumed that in the Table (p. 177, Nov. issue), giving water-levels in the trial pits, "D (East)" should read "B (East)."

The difference in the water-levels existing in the two trial pits mentioned was interesting. It might be assumed that most of the rainwater falling on the area around No. 10 dock was led away by drains, and the difference in water-level in the ground on the two sides had to be accounted for by a difference in leakage occurring from the basins or from underground springs.

Six months after the first readings were taken, it appeared that the water-level on the west side had fallen 1½ foot, whilst that on the east had risen 4½ feet. That would seem to need some explanation in view of the general watertightness of excavation on the east side of the dock.

No mention had been made of any pumping, but Mr. Hooley assumed that a considerable amount was necessary initially to reduce the standing level of the water from 21 feet below cope to the lowest depth of excavation.

In what form had "the three small springs" occurred—was the shillet fissured at that point, or was there any change in the formation there? What remedial measures were taken, and was it necessary to plug or drain away the springs? It would seem that an opportunity was afforded to use the pressure grouting which had proved superfluous to the point of refusal when attempted elsewhere.

In describing the attempts made to ascertain the nature of the concrete in the dam from which so much cement had been lost, the Author had stated that a trench 12 feet long by 3 feet wide was dug to a depth of 20 feet. At that depth the really bad concrete had not been reached, as most of the laitance found outside the intrados piling had, presumably, been formed in depositing the concrete on the lower half of the dam when the 18-inch diameter tube was in use.

The Author's statement (p. 215) that a slight "negative pressure" applied to the dam owing to the water-level inside the dock being 1 foot higher than outside, was sufficient to open up all the construction joints, would seem to suggest a simpler means of dismantling such structures in future. In that instance it might have proved of considerable assistance to loosen up the construction joints by such a reversal of pressure before blasting was resorted to.

Mr. Hooley appreciated that the use of a concrete arch dam as a temporary structure was experimental and involved certain novel features, but he would be interested to know whether its adoption really was, or could be made, the means of saving money and/or time in comparison with the orthodox type of gravity cofferdam.

He also wished to inquire as to the nature and extent of the damage to permanent work occasioned by the use of the 15-lb. plaster charges used in the removal of the dam.

Since the joint between the sill stones and the supporting concrete was frequently the part of a dock most vulnerable to water seepage, the difficulty of bedding the prepared granite blocks should receive further attention. Mr. Hooley presumed that reliance was placed upon the 2½-inch diameter bolts to prevent the sill stones from lifting.

Considerable trouble and expense had been involved in the re-use of granite coping blocks. Whilst that could be excused partly by a desire to make the new wall match the one on the other side, it should be regarded as an extravagance, as there was little reason for the coping to be seriously damaged, and even if it were, it would be easily repaired.

Mr. Hooley presumed that, for the resistance moments of the old and new sections of the dock wall, values should have been given in "foot-tons per foot" not "tons per foot."

No mention had been made by the Author of any attempt to ensure that the wall and floor would act as one, and if it were assumed that no shear resistance was provided at the junction of the new and existing work, the stress on the underside of the toe of the wall would be high. If a stress diagram were to be drawn for the pressure on the rock formation under the wall and floor, with the dock in the condition of being empty and with a vessel docked (giving, say, a superimposed load of 32 tons per lineal foot on the centre-line of the floor), it would show a sudden change from approximately 7 tons per square foot at the underside of the toe of the wall to approximately 1 ton per square foot at the underside of the edge of the floor. Such a change in stress might be permissible where, as in that case, the dock was founded on rock, but it would be very undesirable where a softer material was experienced. Was any account taken of that in preparing the design?

The section of the wall was unusually heavy, for the reasons given by the Author. With the section adopted, the weight per lineal foot had been increased from 92 tons to 126 tons, representing a total addition of approximately 17,500 cubic yards of concrete in the wall of the dock.

The alternative of cantilevering the outer crane rail from the back of the wall, as shown in *Fig. 5*, appeared attractive, and should result in a considerable saving, despite the fact that a greater section of the trench backfill would remain for consolidation after the withdrawal of timbering. By keeping the withdrawal of timber and the consolidation of backfill in step with the advance in the wall concreting, it would be possible to cast the cantilever section supported on that filling and without added expense in shuttering. Moreover, the projection of that cantilever behind the wall would serve to mask effectively the results of any slight settlement in the filling which might occur subsequently.

Mr. R. Graham Keevill observed that the usual methods had been applied for the design of the new dock wall. The wall was assumed to be an independent unit, no support being given by the floor. The ground behind the existing walls was known to be shillet with water originally standing in it at a level of a few feet below coping-level. It was not known whether water would flow freely through the shillet from some unknown source and necessitate heavy pumping during the progress of the work of reconstruction. Pits were therefore sunk to obtain, if possible, some knowledge of the probable quantity of water to be dealt with. During the sinking of the pits large quantities of water were pumped out, with the ultimate result that the ground around No. 10 dock was drained. It was anticipated that in future years the strata would again become water-logged, and allowance was made for that eventuality in the design of the new wall.

The Author had referred to an old scheme for widening by cutting away the altars of both walls and strengthening the walls by adding new concrete to the backs of the walls. The difficulty of bonding old and new concrete was well known. After careful investigation of the vertical and horizontal shear stresses within the wall, it was apparent that both side walls would probably have to be taken down to nearly floor-level and rebuilt.

In 1936, the widening of No. 10 dock at Devonport and of No. 1 dock at Gibraltar became urgent, and no time was available for further argument. The Admiralty departments concerned had stated their requirements and Sir Athol Anderson, K.C.B., M.I.C.E., then Civil Engineer-in-Chief of the Navy, approved the proposal for widening both docks by building new walls behind the old walls on one side of each dock, and widening the entrances on the same side as the new walls. The contract drawings for both docks were completed by a small temporary staff at the Admiralty in about nine months.

In 1923, when the Singapore naval base was in the preliminary stages of design, the Admiralty departments concerned concurred

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H.M. Dockyard, Devonport—*continued*

in an entirely new arrangement of altars for the 1,100 foot dry dock which was built there in subsequent years. That dock was intended to accommodate modern naval and merchant ships of the largest size and had, in fact, docked the Cunarder *Queen Mary*. That departure from the old type of naval dock decided the general profile of the new walls for the reconstructed docks at Devonport and Gibraltar, and all later proposals for other docks. The docks looked strange with an old-fashioned wall on one side and a modern wall on the other side, but they were efficient, and the cost was considerably lower than that of new docks.

When the width of the widened entrance at No. 10 dock was being considered, the final decision was based on the fact that the tidal entrance from the Hamoaze to the closed basin was 125 feet, and that decided the greatest width of any ship that could be docked at Devonport. The width and profile of the widened entrances to No. 10 dock was made the same, and the floating caissons used in both entrances were interchangeable. The entrance width and profile of the new wall decided the width of the reconstructed dock at coping and floor-levels, because the face of the altars of the new wall were kept on or just behind the line of the 1-in-12 batter of the new entrance wall.

The Author had compared the weights of the old and new walls; but they were not really comparable, because the old wall did not carry 50-ton cranes with their wheel loads of 200 tons on a length of 12-feet, alternating either on the back or front of the wall. Nor did the old wall give the accommodation afforded by the new wall.

Built in the new wall was a subway for pipes and electric cables, stairways from floor to coping, with tunnels from its landings to the altars, a magazine-flooding culvert with outlets to hydrants, and a drainage culvert. The design also provided for chambers in the upper part which could have been used for stores, air-raid shelters, etc.; but apparently the wall had been built without them. It would be more correct to say that the back of the wall was modified to suit the contractor's proposals for timbering the trench. When the new wall was designed little information was available in regard to the effect on a wall of a bomb bursting on or near it, and no reasonable allowance could be made in the calculations for such an event; but it was borne in mind that the wall should be as efficient as possible and remain in position when possibly a naval vessel costing many millions of pounds would be in the dock for urgent repairs.

Docks of the future might have to be built with much stronger walls, and hydraulic and earth pressures might not be the only deciding factors.

Mr. E. G. Walker observed that one of the most remarkable features of the work was the composition of the concrete. It was difficult to understand how a fine aggregate containing 10 per cent. of china clay flour, with mica in addition, could be permitted on even second-rate work. The earlier experience of Admiralty standards of civil engineering construction was that they were much higher than those which commercial undertakings and other dock owners could afford to adopt. Yet, from the Author's statement, material which should be rejected for decent cottage building was used in work of primary importance. Great Britain was favoured by the availability of good concrete aggregates, and had not the reason for using poor material that was valid in some countries, namely, that suitable material could not be obtained within a practicable distance of the working site. Therefore, the use of bad material should be condemned all the more strongly.

It was probable that much of the excessive laitance, of which the Author complained, was cement and clay and not simply fine cement as he had appeared to assume on p. 214. Possibly the unsatisfactory finish of the concrete surfaces described on p. 216 was a result from the same cause.

The Author, in reply, observed that, as different speakers had covered similar points, he proposed to reply under the heading of various items of the work rather than to individual contributors.

Wall.—A salt water magazine flooding main was included at Devonport and should have been shown on *Fig. 3*. When warships were at sea magazines could be readily flooded by opening the appropriate sea cocks. Normally, ships were "de-ammunitioned" before dry docking, but should that not be possible the magazines could still be flooded, if necessary, from the magazine flooding main, the sea cocks being connected with flexible hoses to branch pipes off the main.

The mass concrete mix used at Devonport was equivalent to 7 parts of mixed aggregate to 1 cwt. of cement, compared with 12 : 1 at Singapore. At Devonport, the concrete was quite rich enough, but the Author understood that at Singapore it was too poor to hold back water adequately and for future work he would propose a mix of 8 : 1 (8 parts mixed aggregate to 1 cwt. cement) without any special facing concrete. It had been feared, at Devonport, that a surface formed with a 2½-inch aggregate might not wear satisfactory, but a short section of the wall was built as a trial without special facing concrete and six years later it was impossible to distinguish it from the rest.

Concrete was placed in lifts of about 4 feet and in four timbering bags at a time (namely, in lengths of 52 feet), except the bottom lifts, which were specified to be placed in one thickness of 12 feet; there the lengths were 26 feet. Each horizontal joint was stepped 12 inches down to the back to form, theoretically, a shear key, but actually the step was more important as a water bar. Vertical joints were stepped back 2 feet at every other lift, except at the two-third points along the length of the wall, where the joints were in one vertical line. They were chased on plan to form a shear key and a continuous column of bitumen was incorporated as a water seal. They were very successful and it would have been an improvement if all vertical joints had been like them. Altar positions were decided by the Naval Architects and were cantilevered to keep the net offsetting of the face of the wall down to the minimum.

It was not fair to compare the weight of the new wall (126 tons) with that of the old one (92 tons), because the permitted shape of the latter was much more favourable to stability than the almost vertical front of the former. Proper considerations were: (a) was the wall the correct type for the site? (b) if so, was it a good example of its type? The correct type for a wall was governed by site conditions. *Fig. 4* showed an Admiralty design for a stock proposed (but not built) at Belfast, where there was 40 feet of "slutch" (very soft, wet clay) overlaying stiff clay. It was intended to drive steel sheet-piling to the stiff clay and to take the latter out under normal trench timbering methods. The vertical back of the wall would have been back-shuttered off the sheet-piling. Additional piling for the crane and rail tracks well behind the wall was necessary to keep surcharge loading (through the "slutch") off the wall. Taking concrete at 140 lb. per foot, a wall 17 feet deep to that design would weigh 100 tons per foot. Separate piling for the crane track would have cost £20 per foot, for which sum another 10 tons of concrete could have been provided. Thus the effective weight of wall and crane track provision was 110 tons per foot. Judged by British practice, the wall would have been very light indeed. *Fig. 5* showed a design suggested by the Admiralty for the new dock at Cape Town. There the wall was built in "open cut"; good back fill was available and could be tipped to form ground shuttering for the cantilever portion. At a depth of 71 feet, the weight (which allowed for the crane) was 115 tons per foot and, although that was heavier than shown in *Fig. 4*, it would be a cheaper wall because of the ease with which it could be constructed. Weight, therefore, was not the only criterion.

At Devonport, the wall had to be built in trench under very restricted site conditions in the heart of an active dockyard. With the design adopted each operation was complete in itself; excavations, when taken out, could be removed right off the site (no storage for back filling was required); when the concrete was placed the wall was finished: there was no fear of derrick cranes overturning into unstable back fill and subsequent 2-inch driving plant for a piled crane track was not required. Under those very restricted site conditions, the wall was undoubtedly of the right type. By comparison with *Fig. 5*, it was 11 tons per foot too heavy, but the front profile was less favourable and, as "open cut" was not possible, the weight would not have been reduced

H.M. Dockyard, Devonport—continued

below 120 tons per foot. The wall was designed to act independently of the floor—quite permissible in rock—but on the site a skew-back joint was made between the two.

Dam.—From the Admiralty point of view, the dam was good. It was completed within 6 months of placing the contract; it was almost completely watertight and had a reassuring appearance of ample strength. Final removal took 6 months, but sufficient was removed in 2 months to allow a ship to be docked. Removal was difficult because of the uneven quality of the underwater concrete, and the Author doubted if that defect would ever be overcome. Indeed, he doubted if concrete deposited in the dry (such as the old dock wall) could be blasted away in even regular layers 50 feet high. The long tube was designed to be used as a skip and would have had to be altered to be used as a tremie.

The Devonport dam was founded on good rock and the water-level in the closed basin was almost constant; there was no tidal range. Damage from the blasting was nil, because the size of charges was limited by the Admiralty. Small charges were always used first and were increased gradually to what was considered to be an acceptable maximum, arrived at only by "judging" the magnitude and effect of the tremors produced in the dockside area.

South End Wall.—The area between the south end wall and the existing caisson was only drained by the Admiralty because the caisson happened to have a through drain in it. At the north end, the caisson had no through drain.

Mr. Wilson's calculation of 2,400 cubic yards of concrete being placed in a volume of 3,600 cubic yards was correct on the information given in the Paper. By amplifying that information, however, the figures should be 3,000 cubic yards.

The actual concreting time was more nearly 7 days than 6; the skips were piled very full with dry concrete and contained "very good measure"; a period of very low spring tide was chosen, and in *Fig. 7* the mean tidal range as given should be increased to nearly 20 feet.

Masonry.—Joints for dressed work were $\frac{1}{4}$ inch thick and the accuracy of 0.004 inch was quite adequate; but for future work it was most probable that concrete to an accuracy of $\frac{1}{8}$ inch would be used in conjunction with rubber gaskets on the caisson. Skip caissons were adopted because, with the widening of the entrance, there was not sufficient space between the adjoining docks to build cambers for sliding caissons. The sill arch had to be completely rebuilt on account of the increased span. Hardwood wedges were permitted up the quoins because they were only temporary; they were not referred to in the specification.

Venting of Floor.—Although the non-return valves on the vents did not work, owing to fouling of the seatings, some of the vents definitely weeped water when the dock was dry, and without them full hydraulic pressure would undoubtedly be built up. No attempt was made in the design to assess the quantity of water to be dealt with. In fact, it was very small indeed—probably no more than a few gallons per minute throughout the whole dock. Admiralty experience, however, at numerous dockyards at home and abroad, was that the danger of floor lifting was very real indeed and some floors had actually lifted. Quite small holes had always been sufficient to relieve the pressure and the Author concurred with the suggestion that floors should be of regular permeability throughout their full depth. Admiralty troubles had always been associated with the combination of an almost impermeable top layer of granite bedded on a relatively permeable, and much thicker, bottom layer of concrete.

Crane Track.—No attempt was made to drain the duplex tracks. Doubtless Mr. Ridehalgh's question was based on his tropical experience, where drainage was essential as an anti-malarial measure.

The crane track had to carry four wheel loads, each of 50 tons, spaced at 3-foot 6-inch centres, and the design was based on the usual assumption of a continuous beam on unyielding supports. On that basis, piles had to be at 6-foot 6-inch centres to keep the maximum pile loads to 100 tons. Since then the Admiralty had developed a method of taking into account the (relatively) very high stiffness of the beams and the settlement of the supports (the piles),[1] whence pile centres could be increased to 10 feet.

Dimensions.—The new dimensions, given as widening from 121 feet to 151 feet at barrel cope and from 74 feet to 103 feet at floor, referred, inadvertently, to lines used for setting out purposes. They should have been 121 feet to 143 feet and 74 feet to 114 feet respectively.

Pumphouse.—The pumps, as originally installed in 1906, were steam and were replaced during the widening of No. 10 dock by new electric pumps. The steam pumps were due for renewal irrespective of the widening but, on account of the latter, the new pumps were made larger.

Costs.—The costs referred to the civil engineering works only and did not include the caisson, the pumps, the cranes, or any other mechanical equipment.

In reply to Mr. Hooley, the small quantity of water running into the trial pits was dealt with in the open trench by simply running it into a channel. As the wall was built up, the sump was also built up, and when the wall was halfway to the top and the sump was about 40 feet deep, the water was pumped out very rapidly and the sump was filled with concrete as quickly as possible. The water had made the rock very greasy, and at the place where 30 feet of rock was unsupported a slight slip had occurred.

[1] See W. Elsby, "Continuous Beams on Elastic Supports," "Concrete Constr. Engng," November, 1943.

Correspondence

To the Editor of "The Dock and Harbour Authority."

Dear Sir,

War-Time Engineering Problems "Phœnix."

May I trespass on your space with yet another letter on the above subject?

When I wrote my first letter in October I did so mainly to contest certain dogmatic yet entirely unsubstantiated opinions given in Mr. Minikin's August article and despite the opening paragraph of his letter in your November issue I venture to think that the engineering profession will find nothing of scientific interest in bare statements of opinion unless these are accompanied by scientific or at least technical reasoning.

I took particular exception to his statement that "may be the multiplicity of counsels or the urgency of the deliberations, or perhaps both, resulted in the adoption of one of the most unwieldy forms of caisson for the breakwater" and the further reference to them as "clumsy and ill-adapted."

I must point out that Mr. Minikin's reply to my letter still does not offer a single technical reason in support of such a statement.

Yours faithfully,

W. J. HODGE.

Chief Engineer's Dept.,
Port of London Authority.

Notes of the Month

Association of Port Employers.

Mr. Colin S. Anderson has been appointed chairman of the National Association of Port Employers as from January 1st, 1948, in succession to Sir Robert Letch. Mr. Anderson is a director of Anderson, Green & Co., Ltd., managers of the Orient Line.

Increased Traffic at the Port of London.

During the seven months ended October 31st, 24,306,381 net tons of shipping arrived at and departed from the Port of London. This shows an increase of 19 per cent. over the corresponding period of last year (20,432,075 tons). The traffic was 17 per cent. of the total shipping using all United Kingdom ports during the seven months.

Retirement of Port of Bristol Chief Engineer.

Mr. W. P. Wordsworth, who has just retired from the position of chief engineer to the Port of Bristol Authority, entered the service of the port in April, 1908, and was appointed chief engineer in 1931. He was due for retirement earlier this year but at the request of the Port Authority he remained in office during the establishment of his successor, Mr. N. A. Matheson. On his retirement, a cheque was presented to him at the docks offices, Avonmouth, by Alderman A. W. S. Burgess, chairman of the Authority, on behalf of the staff of the docks undertaking.

Tyne Development Schemes.

The question whether land adjacent to Jarrow Slake should be used for factory construction or for a dock extension scheme with quays and railway sidings as proposed by the Tyne Improvement Commission, is still undecided. Recently, the borough engineer of South Shields in a report to the Town Council, stated that the plan for using the land for factories obviously conflicted with the Tyne Commissioners' scheme, and at a conference of the parties concerned it was decided to obtain the views of the Board of Trade on the issue.

Improvements at Port Adelaide.

Three new concrete berths and additional cargo sheds are among improvements planned at Port Adelaide, by the South Australian Harbours Board. The estimated cost is £600,000, and it is hoped construction will begin at an early date. Plans have also been announced by stevedoring companies for the mechanisation of cargo handling facilities. A company, to be called the Port Adelaide Haulage Co., will replace the present obsolete system by modern methods which will speed up work and will require fewer men, so helping to cope with the present acute man-power shortage. Port Adelaide during the past twelve months has been at its busiest for ten years, and congestion and delays at the port have been causing anxiety.

Season Ends at Port of Montreal.

The British cargo steamer *Ocean Liberty* (7,173 tons gross) which left Montreal, Canada, on 5th December last, was the last ocean-going vessel to leave the port this season. She was carrying 275,000 bushels of grain and 2,750 tons of flour. A little earlier on the same day, the *Fort Finlay* (7,134 tons gross) sailed with 325,000 bushels of grain. Including these cargoes, a total of 61,975,892 bushes of grain have been exported to the British Isles and the Continent from Montreal this season.

New Fire-Fighting Plant for Port of Melbourne.

A new air foam plant to combat fires has been built in Australia for use by the Melbourne Harbour Trust. It has been highly praised by shipping authorities as being especially suitable for coping with fires in the engine rooms or holds of ships while in port. The equipment is driven by a Diesel engine and is designed to throw a blanket of foam over the whole of the engine and boiler rooms of a vessel within four-and-a-half minutes. This is achieved by a system of pipes which draw sea water through the side of the ship to be mixed with the foam-making material. The foam, which is mechanically and not chemically made, is then projected through nozzles placed to ensure even distribution over the area threatened by the fire.

Transit Sheds for Port of Glasgow.

Great satisfaction is felt in Glasgow at the Government's recently announced decision to allow the Clyde Navigation Trust to proceed with their £430,000 scheme for the construction of transit sheds at the Port of Glasgow. These sheds are to be erected on the western side of King George V Dock, the most recent extension to the port. While berthage is available at this point, there are no sheds, and it is intended that vessels of Clan Line Steamers, Ltd., should berth and discharge at this particular part of the dock. The Trustees have accepted tenders amounting to more than £40,000 for work authorised in connection with the scheme of electrification and improvement at the South Quay, Princes Dock, and at the graving docks.

Inverness Harbour Improvement Plans.

Inverness Harbour Trustees have under consideration plans for the repair and improvement of existing quays, and the provision of a new deep-water berth for ocean-going vessels. Early last month, a conference was held at Inverness between the Town Council, the Department of Health, and the War Department, to discuss the future use of ground at the Longman Airport, adjacent to the harbour, which the War Department wish to acquire, but which has been scheduled by the Town Council for harbour extension and industrial development. The Town Council have drawn up a new plan, which will enable development to take place, and will also provide 164 acres for the War Department.